1-1-1998

Validating the process of designing and developing instructional materials using the rapid prototyping methodology

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VALIDATING THE PROCESS OF DESIGNING AND DEVELOPING INSTRUCTIONAL MATERIALS USING THE RAPID PROTOTYPING METHODOLOGY

by

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DISSERTATION

Submitted to the Graduate School

of Wayne State University

Detroit, Michigan

in partial fulfillment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

1998

MAJOR: INSTRUCTIONAL TECHNOLOGY

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Dedication

This dissertation is dedicated to my husband Louis

and to my parents, LeRoy and Hermalene Stokes.

Thank you for your love, support and prayers.

Acknowledgements

I thank God for this journey that I have completed. His grace was indeed sufficient to keep me committed to the work that had been set before me.

I thank my husband, Louis, for being my research assistant and for his unwavering love, prayers and support.

I want to extend my thanks to my dissertation committee for the encouragement that enabled me to complete this dissertation -- Dr. Rita Richey, Dr. Gary C. Powell, Dr. Alvin Edelson and Dr. Steve Salley, thank you very much. I particularly want to thank Dr. Richey for her tireless support as my committee chair, advisor and mentor.

I am very grateful to the professionals from The Emdicium Group, Inc. and to their customers who contributed to my study. Their interest, feedback and encouragement were indeed an inspiration. I especially want to thank Bill Clayton for spending so many hours of his own time to edit my dissertation for me.

Finally, I want to thank my family and friends who prayed for me and provided a listening ear and encouraging words throughout my entire doctoral studies. I have truly been blessed by everyone's support in this endeavor.

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Chapter 1

Statement of the Problem

When developing instructional materials, particularly computer-based instructional materials, many companies are looking for ways to reduce the time required to design and develop instruction. Additionally, there is the goal of increasing customer satisfaction through the development of a quality product. For some situations the answer may be the use of rapid prototyping methodology.

Rapid prototyping is the development of a working model of an instructional product that is used early in the project to assist in the analysis, design, development, implementation and evaluation of an instructional innovation. The prototype evolves into the completed instructional product. Rapid prototyping involves the interaction of the customer and the entire design team early in the project.

The intention of this study is to validate the use of rapid prototyping as a possible way to design quality instructional materials faster and better both for computer-based and paper-based products.

The Nature of Rapid Prototyping in Instructional System Design

According to Jones, Li and Merrill (1992), to prototype is to develop an executable version of a product which incorporates key elements of the final version but which is incomplete in many respects. Lowry and Little (1985) define prototyping as "a working model of automated information processes which begins as a trivial representation and evolves into a full-scale functional information system (p. 5)." Other definitions emphasize benefits such as greater user involvement in the development process, thus fostering ownership of the application project. An important thing to

remember is that a prototype is not the finished product, but a workable model of the finished product. Like traditional instructional systems design (ISD) models, rapid prototyping begins with an analysis of the content, audience, environment, instructional needs and objectives. While analysis, design and development can be and often are three distinct phases of a project, rapid prototyping integrates the three phases. Although this integration lengthens the analysis and design time, it is thought to shorten the development time because it is not necessary to complete one stage before moving into the next and it allows for customer input long before the product is completed. The output of the integration is a prototype that is evaluated by the design team and then revised as appropriate. The prototype gets better with each iteration.

Unlike traditional ISD models, rapid prototyping utilizes parallel processing of analysis, design and development of the product. Based on customer usage, the prototype is refined until the product is complete. The number of iterations of the prototype is usually kept to a minimum in an effort to contain costs and time. Consequently, the customer -- including program sponsors, subject matter experts, internal instructional designers and end-users -- and the design team must have a clear understanding of the purpose, audience and functionality of the finished product that the prototype will reflect.

Although the term rapid prototyping is relatively new to the field of Instructional Technology, the underlying methodology is not. Prototypes have been successfully used in hardware engineering as a way of testing ideas (Tripp & Bichelmeyer, 1990). The manufacturing industry has used prototyping as a means of producing a model of a finished product to indicate usability and error. The advantages of rapid prototyping in the hardware engineering environment are that it allows the user to interface with the system,

identify problems and have input into the selection of an appropriate interface (Tripp & Bichelmeyer, 1990).

Rapid prototyping encourages iterative design, based on feedback from the learner and from the designer by observing how the user interfaces with the prototype. Thus it promotes more effective communication. Unlike many traditional instructional development models, rapid prototyping is nonlinear. Analytic, developmental and evaluative activities are tightly intertwined (Goodrum, Dorsey, Schwen, 1993). Given these characteristics and the fact that the instructional design process has a similar need for these processes, it can be said that rapid prototyping is also appropriate for instructional design because it allows for the flexibility needed when dealing with a human-factors-intensive field such as the process of creating instruction (Tripp & Bichelmeyer, 1990).

Because ISD is seen by some as linear and hierarchical, rapid prototyping has been greeted with caution. However, it has been found that the non-linearity and non-hierarchical nature of rapid prototyping affords modularity and flexibility that is important for instructional design. Some feel that instructional designers need a system that allows modifications late in the development cycle (Lewis & Mace, 1988) and rapid prototyping accommodates these needs. However, late modifications are expected to be minor because earlier versions of the prototype presumably have identified major changes.

The general purpose of rapid prototyping is to realize the conceptual structure of the final product while not incurring the expense of the full product development cycle (Jones, Li, & Merrill, 1992). The rapid prototyping methodology enables the designer to decide what methods of instruction are best while acknowledging rather than minimizing the complexity of actual situations (Tripp & Bichelmeyer, 1990). Other purposes of rapid

prototyping are to try-out new ideas and share them with colleagues in a manner similar to pen/paper design known as storyboarding. However, with rapid prototyping the try out product has some functionality of the final product whereas storyboarding does not. The prototype represents an idea to a customer more than a lengthy page analysis or design document.

Researchers such as Jones, Li and Merrill (1992), Lewis and Terry (1989), Haugen and Nedwek (1988), Gray and Black (1994) agree that prototyping tools are a necessary component of rapid prototyping. The software used to develop the prototype does not need to be the exact software that will be used to produce the final product but it must be able to emulate the software used on the finished product. A goal of the prototype, according to Gray & Black (1994) is to be produced cheaply and quickly. Minor flaws are acceptable. Maintenance is not an issue because the prototype will, in all likelihood, be discarded after use or evolve into something more robust.

Rapid prototyping has been determined to be an effective and time-saving tool for designing computer-based and hypertext instruction, and it may well prove to be a viable tool for the design of paper-based instructional materials as well. This timesaving process is known as design reduction. One reported advantage of rapid prototyping is cycle-time reduction (Arthur, 1992). Cycle time used in the design context includes analysis/planning, design, development and delivery of a product to the customer. Delivery means physically giving the customer the instructional product. It does not involve implementation. Burkart says that "cycle time is measured as the starting and ending points of the time required from needs validation to new product or process commercialization (Burkart, 1994, p. 30)."

The length of cycle time is important to any instructional design project because it impacts delivery and implementation of the product with the end-users. The answer to today's fast-paced I-want-it-now society is to reduce cycle time and get a quality product in front of the customer quickly. According to Arthur (1992), the prototype reduces cycle time by a factor of four or more when developing software.

Although rapid prototyping is typically used with computer-based products, it also appears to be appropriate for paper-based products. Berry, Mobley and Turk (1994) of the International Business Machines Corporation (IBM) suggest that a prototype be created of both user documentation and the associated computer-based product (esp., object-oriented projects). Providing a documentation prototype with the product prototype gets customer input and improves usability with each iteration of the prototype. A prototype of user documentation can be helpful in determining whether the documentation should be a paper or an online product. Like the computer-based prototype, the prototypes of the user documentation will probably change based on customer feedback. Consequently, the final product that evolves from both prototypes will be based on the customer's wants and needs. One critical factor is that the prototype is typically evaluated by only a small number of end-users. A small number of users will likely produce the same result, but at less expense when tests with a large group are done.

Many researchers have found that the rapid prototyping methodology can be a viable alternative to traditional instructional design (Tripp & Bichelmeyer, 1990). However, rapid prototyping is not recommended for all instructional situations. Nor is it assumed that traditional design models are ineffective. Rapid prototyping is not effective if cost and time are increased because it can be an indication of a lack of communication and

analysis between the customer and the design team (consisting of subject matter experts and needs analysts) about the expected finished product.

The beneficiaries of rapid prototyping are the users – the customer and the design team. The benefits are realized when the customer and the design team are able to interact with the product early on and determine that it satisfies the intended objectives. User participation in the prototype is very important to the design and development cycle because feedback may signal another iteration of the prototype with specific changes to make it more functional and to better the final product. The user should interact with the prototype, while keeping in mind the requirements of the final product. The prototype fosters communication between the program sponsors, end-users and design team (Gray & Black, 1994).

For the customers, the prototype is a sample of the finished product, which can be used to check their opinions of it. For the design team, the prototype provides a complete picture of the final product for all members of the team. The prototype also provides the opportunity to check the whole structure and quality of the product (Kim & Reigeluth, 1995).

Rapid prototyping ideally:

1. affords the user the opportunity to review and utilize the program and suggest changes based on the user interface;
2. enables the developers to review user performance based on the interface and to update the interface in an effort to minimize errors and increase customer satisfaction;
3. encourages the team to consider alternative interfaces and modifications of

interfaces;

4. gives the user a more immediate sense of the proposed system and thereby encourages the customer to think more carefully about the needed and desirable characteristics of the system;
5. reduces the likelihood of project failure (Wasserman & Shewmake, 1990); and
6. reduces cycle time because a small portion of the finished product represents a great deal of the finished product.

Based on the above characteristics, rapid prototyping appears to help produce quality instructional materials in less time than traditional instructional development processes.

Using Customer Input to Insure Quality Instructional Materials

A prototype can afford the customer and the design team the opportunity to interface with the product, as though it were complete. The interface is typically interactive and enables the customer to see the sequencing of the content and the basic structure. The customer can ascertain shortcomings in the instruction. Because the prototype evolves as a result of the interface and resulting modifications, a quality product is more likely to be developed.

Quality instructional materials can only be produced if the customer can articulate the precise functions of the product. In many situations it is a subject matter expert who is best able to explain product functions.

Customer satisfaction is also dependent upon the speed with which the product is created. Customer satisfaction varies from customer to customer, but some key characteristics are that:

- the product is delivered within budget and on time;
- the design and content specifications are met;
- the customer and subject matter expert are actively involved throughout the entire process; and
- the instructional designer is responsive to the customer.

Customers are also encouraged to think about and communicate their requirements to the designers and determine if the product meets their requirement (Gray & Black, 1994). This communication is best done during the review of the prototype(s).

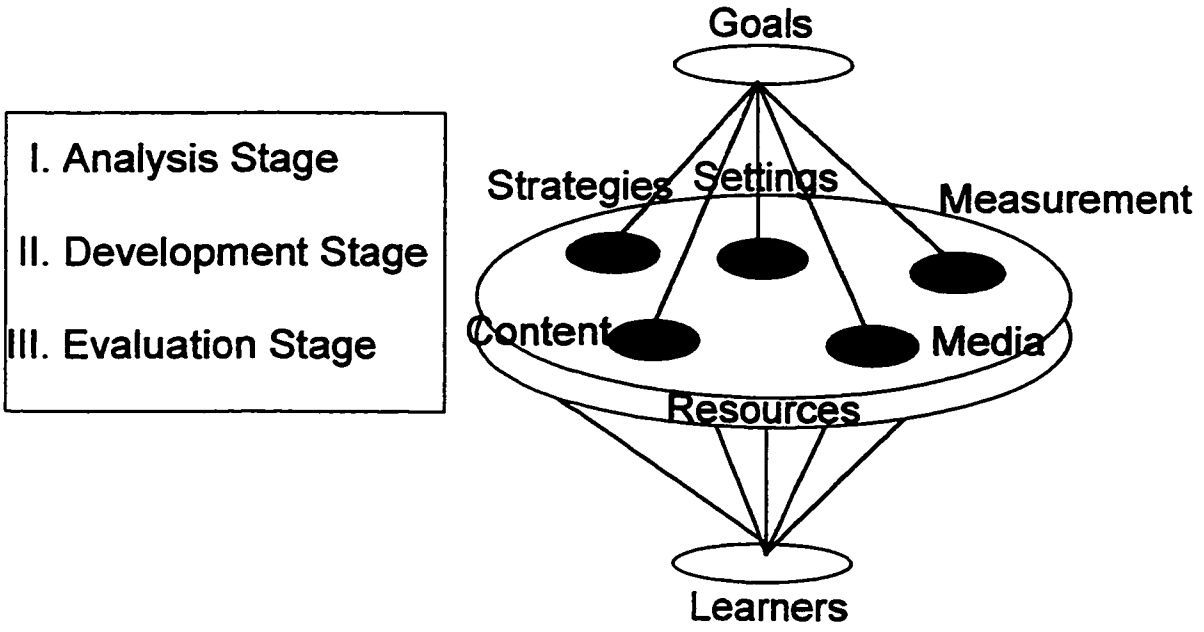
Rapid Prototyping Design Models

Rapid prototyping design models are typically used in the software-engineering domain. In recent years, instructional designers and academics have also devised instructional design models that incorporate the rapid prototyping methodology. This section will discuss three rapid prototyping models. The first model to be reviewed was designed for use in courseware production settings and was designed by Chia-Shing Yang in 1994. The second model was created and used by The Emdicium Group, Inc., an instructional design-consulting firm. The model was used to guide the design and development of paper-based and computer-based courseware. The third model was created by Tripp and Bichelmeyer and published in Education, Technology, Research and Development in 1990.

Yang's Instructional Design Model. Chia-Shing Yang constructed an instructional design model with a software engineering approach for use in developing computer-based courseware (Yang, Moore, & Burton, 1995). Yang's model evolved from a generic instructional design model, is three-dimensional, and has three stages and ten activities

(Yang, Moore, & Burton, 1995). The model, shown in Figure 1, utilizes the instructional systems design phases of analysis, development and evaluation. When using this model, there are nine different roles of the design team members for the production of the courseware.

Figure 1. Yang's Instructional Design Model



Note: From "Managing Courseware Production: An Instructional Design Model with a Software Engineering Approach," by Yang, C., Moore, D. M., & Burton, J. K. (1995). Educational Technology Research & Development, 43, p. 62.

This model is best used in conjunction with a software-engineering based template for managing production activities. The template has major tasks accompanied by sub-tasks as deemed appropriate and identifies primary and secondary roles of the team members for each task. The following tasks are in the template:

0. Setting up working place

1. Orientation meeting

2. Analysis stage

2.1a Define goals

2.1b Define learners

2.1c Define resources and constraints

2.2 Confirm analysis

3. Development stage I (prototype design)

3.1a Construct content

3.1b Design objectives and test items

3.1c Select media

3.1d Design instructional strategies

3.1e Select settings

3.2 Evaluate prototype

3.3 Refine prototype

3.4 Confirm prototype

4. Development stage II (formal production)

4.1a Content writing

4.1b ID modeling

4.1c Art works

4.1d Media producing

4.2 System integration

4.3 Preparing manuals

5. Evaluation and promotion stage

5.1 Pilot test

5.2 Refinement

5.3 System documentation

5.4 Acceptance confirmation

5.5 Pack and release

5.6 Summative evaluation

6. Final report

(Yang, Moore & Burton, 1995)

The template further indicates who performs the tasks and sub-tasks as well as who has primary and secondary responsibility for each task and sub-task. For example, the project manager has the primary responsibility of setting up the working place, and typists and other logistic persons have secondary responsibility for setting up the working place.

Utility of the model and template was verified through testing in an example project that produced a college-level-courseware unit for a Plant Science Laboratory. The activities follow.

A given member of the design team may have multiple roles on the project. For example, in the Plant Science Laboratory project, one person was the project manager, media specialist, instructional designer, artist and logistical person. Three instructors were content experts. There are nine of these roles on the design team. They are:

1. sponsors, customers, instructor and students who either support or use the courseware;
2. project managers who carry out administrative tasks that include negotiating with the sponsors and customers, constructing a schedule, regulating the budget and

coordinating the tasks of the project team;

3. content experts who are proficient in a given subject area; they must be able to provide accurate and current information as it relates to the content and the instruction;
4. instructional designers who are familiar with instructional theories and educational environment, as well as the pros and cons of using computer-based courseware; (It is helpful for these individuals to have experience in using computer-based courseware in an instructional setting and have teaching experience. According to Yang, Moore and Burton (1995), the designer's main purpose for being on the courseware project is to define courseware structures based on the results of learning and goals analyses. The designers also work with the content experts.)
5. media specialists who are proficient in producing media and computer programming. Multimedia is a requirement for these individuals;
6. artists or musicians who supply graphics, music and other artistic content based on the specifications of the courseware;
7. external evaluators who are proficient in instruction and computer-based learning media and who know the target audience. They judge the product for quality and provide suggestions for improvement;
8. support staff who do administrative tasks such as bookkeeping, word processing, document preparation and delivery; and
9. librarians who maintain the records of the system documents. "They register the graphic files, program routines and courseware units" (Yang, Moore & Burton, 1995, p. 67).

The first stage of Yang's model is the Analysis stage, which includes learner analysis, goals analysis and resources analysis. Each of these activities can be conducted concurrently or sequentially, and the results provide the input for the second stage.

The second stage of the Yang model is the Development stage, which is divided into two substages – Development stage I is prototype design, and Development stage II is formal production. The activities in this stage can be done concurrently or sequentially and are subject to change based on the findings from formative evaluation. The goal of Development stage I -- prototype design -- is to produce a courseware prototype. Development stage I activities can include construct content, design objectives and test items, select media, design instructional strategies, select settings, evaluate prototype, refine prototype and confirm prototype. The production team and sponsors who are external evaluators in the workplace must review the prototype. In Yang's model the entire product is prototyped unless the prototype is a "generic template to be used across multiple units" (Yang, Moore, & Burton, 1995, p. 64). The prototype can be paper-based or a simpler courseware prototype. After refinement and approval, Development stage II (formal production) begins. Formal production can include continuous content writing, instructional design modeling (e.g., objectives, structure contents, organization of activities, etc.), creating art works, producing media, integrating content, programs, video and preparing manuals.

Stage 3 is the Evaluation and Promotion stage where the goal is to test the context and prepare the product for release. The activities in Stage 3 include pilot testing, refinement, system documentation, communication of acceptance, packaging and release, and summative evaluation.

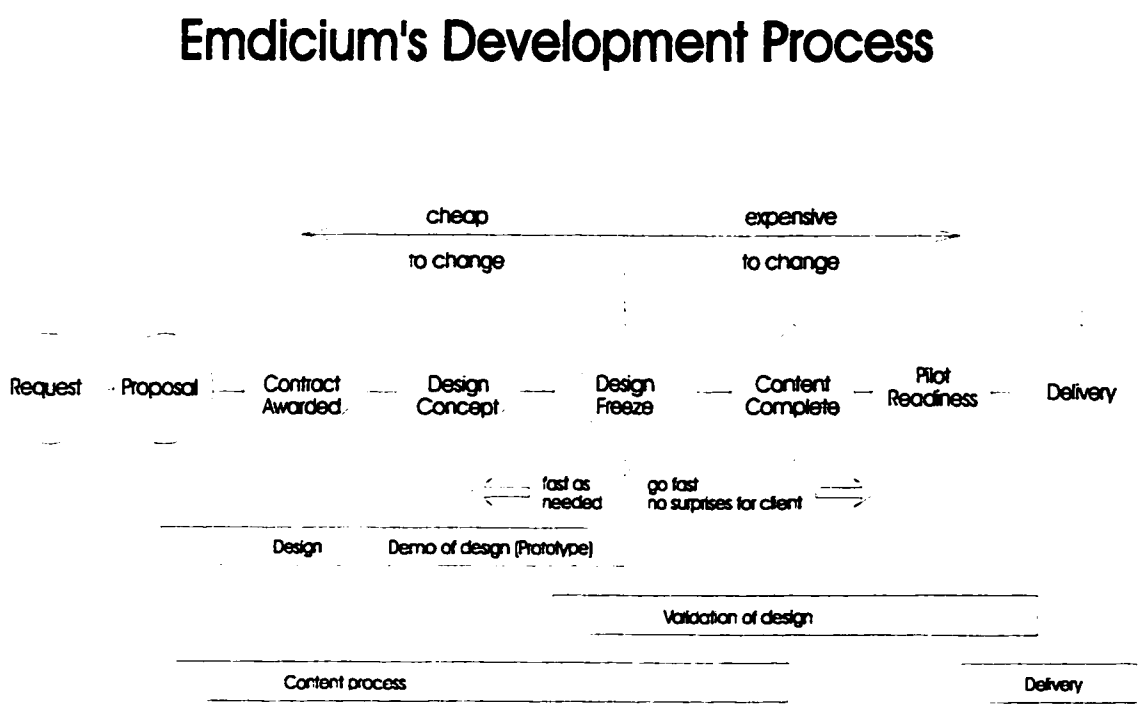
The Emdicium Group, Inc.'s Instructional Design Model. The Emdicium Group, Inc.'s instructional design model (hereafter referred to as the Emdicium model), as shown in Figure 2, has been used from 1990 - 1998. This model integrates rapid prototyping into the design of paper-based instructional materials as well as computer-based materials.

The Emdicium Group, Inc. has adopted a fast cycle-time approach that complements the systems approach. The principals at Emdicium believe that simultaneous processing, dedicated teams and timely management decisions can significantly reduce development time and cost. Additionally, they believe this can be done without detracting from the quality of the product (The Emdicium Group, Inc., 1993).

The Emdicium approach follows an accelerated approach to instructional systems design. Emdicium says its process reduces time in the Development stage, which is typically the longest and most arduous phase, and it adds time to the Analysis and Design stage in an effort to reduce overall cycle time. The traditional design document is replaced with a prototype that actually models the product's structure and design. The Emdicium approach has three major milestones -- Kickoff, Design Freeze and Pilot Ready -- accompanied by the tasks shown in Table 1.

Following the Kickoff meeting is a Design Concept meeting in which the Emdicium team presents the overall treatment of the product to the customer. The treatment may include artistic appearance, user interface, learning process and content organization. The content is initially presented in an outline, which progresses to the total document.

Figure 2. The Emdicium Group, Inc. Instructional Systems Design/Rapid Prototyping Model



the emdicium group, inc.sm
instructional innovation

Table 1
Rapid Prototyping Tasks in the Emdicium Model

1. Identify the audience
2. Identify instructional need
3. Identify content, tasks and processes
4. Identify instructional strategies
5. Write the design memo
6. Write the high-level content outline
7. Identify the content for the prototype
8. Build the prototype

Table 1 continued
Rapid Prototyping Tasks in the Emdicium Model

9. Review the prototype
10. Get agreement regarding the prototype and freeze the content
11. Write the remaining components
12. Pilot the product
13. Revise the product based on the pilot
14. Deliver the product to the customer

The Kickoff meeting takes place after the contract is awarded and brings together the customer and Emdicium staff. During the Kickoff meeting agreement is made on roles and responsibilities, reviews, schedules and other business matters. The project plan, including goals and objectives, is the product of this meeting.

Once consensus on the project is reached, a design memo illustrating and describing the agreement is delivered to the customer. Based on the agreement of the contents in the Design memo, prototype building begins. There may be two prototypes, depending on the project – a Design Prototype and Technical Prototype. The Design Prototype models appearance, structure and features. Customer feedback and interface with the Design Prototype help to improve the design and identify needed changes. The Technical Prototype is typically used to demonstrate feasibility of the prototyping tools and processes to be used in the development of computer-based products. For paper-based products, the Design Prototype and Technical Prototype may be presented in one prototype because there may not be any technical components. The prototype reflects the overall format, flow, goals, objectives and activities of the instructional product. Additionally, there is one completed unit of instruction that has the specific format, flow,

goals and instructional strategies for that unit and subsequent units.

Acceptance of the prototype, with any changes, means the Emdicium staff expects that the format, flow and goals of the instructional product will not change. This milestone is labeled Design Freeze and means that further changes will be limited to word changes and minor graphic changes, but not changes to structure and treatment. For all intents and purposes, the content is considered complete at the Design Freeze milestone. Because the content, structure and appearance of the program are assumed to be completely defined at this point, rapid progression of the instructional product starts.

Each portion of the prototype is tested and reviewed to reflect customer feedback on usability and accuracy as the product moves toward completion and the last milestone, Pilot Readiness. Pilot Readiness indicates that the product has been completed and is ready to be pilot tested. The product is pilot tested with actual users of the product and may indicate the need to make minor revisions in things such as timing and flow of activities. After any revisions are made, the final product is delivered to the customer.

In some organizations, an instructional designer does an analysis of the need and tasks, documents an instructional design strategy, and then gives a design memo to a writer for development (i.e., writing). In other organizations, the instructional designer does the analysis and design, as well as the development of the instructional innovation. Design and development at Emdicium typically include analysis, development of a design memo, prototype development, prototype revision, identification of instructional strategy/treatment, content development, page and screen format, user interface design, graphics design and pilot testing. If deemed appropriate, may also include the sales cycles. Table 2 illustrates the design and development cycle activities of an instructional designer

at Emdicium; however, these same activities can be used at other organizations as well.

Table 2
Design and Development Activities of Emdicium Designers

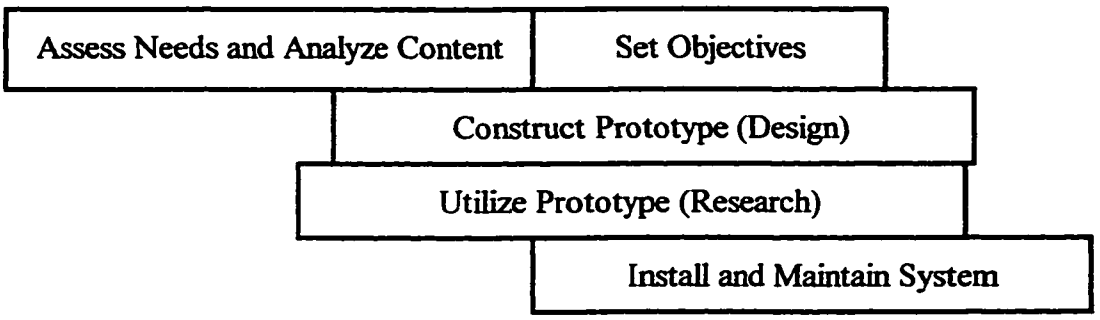
Emdicium Design and Development Cycle		
Contract Awarded	Designer/Developer Activities	Delivery
	• Analysis of audience, need, task, situation • Design memo • Prototype design • Prototype evaluation • Prototype revision	Production of: ◆ Content ◆ Graphics ◆ User interface ◆ Screen design ◆ Page layout • Pilot testing • Revision	Based on Customer satisfaction including • Product usability • On-time delivery • Meeting budget expectations • Meeting expectations of: ◆ Design ◆ Format ◆ Accuracy

Tripp & Bichelmeyer's Rapid Prototyping ISD Model. Tripp and Bichelmeyer (1990) produced a rapid prototyping instructional systems design (ISD) model, shown in Figure 3, that represents the events that occur in an environment when using the rapid prototyping methodology for instructional design. As they have indicated, their model does not completely represent rapid prototyping but it does provide a picture of what it is. The boxes overlap to represent the non-linearity aspect of rapid prototyping.

As with most ISD models, the Tripp and Bichelmeyer model starts with analysis of needs and content and the identification of objectives. The purpose of identifying the objectives is to facilitate defining the plan. The process continues with design and research, which are supported by the construction and utilization of the prototype. The result of the design is a complete understanding of the needs, content and objectives. The

research component is used to discover the complexity of the content, prerequisite knowledge and the presentation method for acquiring the materials.

Figure 3. Trip & Bichelmeyer's Rapid Prototyping ISD Model



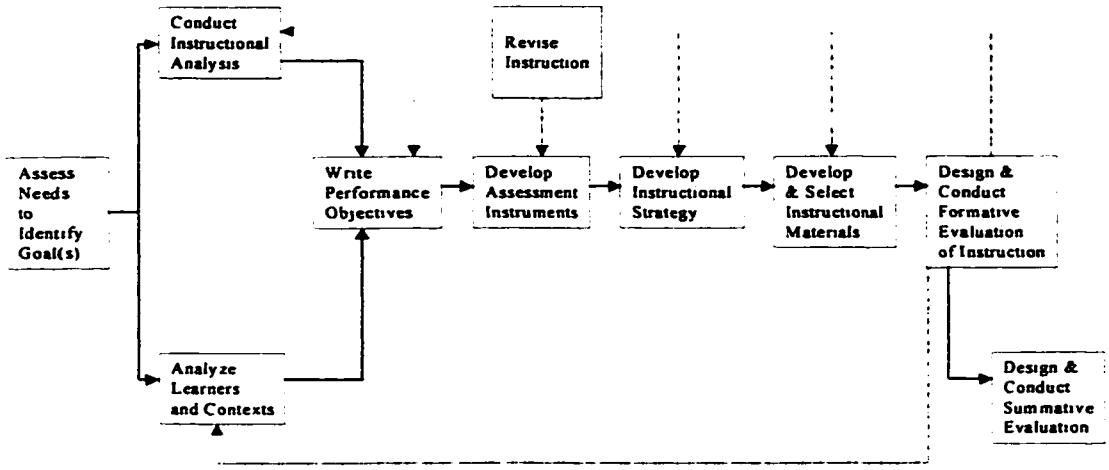
Note: From "Rapid Prototyping: An Alternative Instructional Design Strategy," by Tripp, S. D. & Bichelmeyer, B. (1990). Educational Technology Research & Development, 38, p. 36.

Comparing an Instructional Systems Design Model to Rapid Prototyping Methodology

All of the examples of rapid prototyping models can be contrasted to the more commonly used ISD models of which the Dick and Carey Systems Approach Model to Designing Instruction (Figure 4) is a prime example. It is considered by many in the field as the most appropriate model to use when teaching students of instructional technology. It is a systematic model that can be used to design paper-based and computer-based instruction to be used in a classroom/training setting or for a self-instructional situation.

The purpose of this section is to compare the Dick and Carey Systems Approach Model for Designing Instruction (Dick and Carey model) with the rapid prototyping methodology. The Dick and Carey model suggests performing many of the same tasks that are suggested when using the rapid prototyping methodology. For example, in using the Dick and Carey model, as with the rapid prototyping methodology, a needs assessment is conducted to identify instructional goals (Dick and Carey, 1996).

Figure 4. The Dick and Carey Systems Approach Model for Designing Instruction



Note: From The Systematic Design of Instruction (p. 2- 3), by W. Dick and L. Carey, 1996, New York: HarperCollins. Copyright 1996 by Walter Dick and Lou Carey. Reproduced by permission.

The Dick and Carey model is often used in a fixed and linear fashion. Novices easily use it. What makes the Dick and Carey model obviously different from a rapid prototyping model is that a prototype is not part of the process and novice designers typically use it. Additionally, because the Dick and Carey model is often used linearly, it appears as though one phase must end before the next phase begins. Although the Dick and Carey model is often used linearly, as in rapid prototyping models, there is some concurrent processing. For example, in the Dick and Carey model the instructional designer conducts the instructional analysis and analyzes the learners and the context concurrently. With rapid prototyping models, particularly the Emdicium rapid prototyping model, the instructional designer concurrently identifies the audience, instructional need,

content, tasks and processes and instructional strategy.

With the Dick and Carey model, formative evaluation is done in three phases -- one-to-one, small group and field trial -- is conducted without a prototype as with most models, is typically done after production of the first draft of the instruction. However, Walt Dick and Lou Carey also suggest that the instructional designer use formative evaluation methods that include using the information from the instructional analysis to explain to learners from the target population what will be taught. This should be done during the context analysis phase. They also suggest that the instructional strategy be used to teach some learners. The reason for such suggestions is to gather information from learners "in order to revise the materials before proceeding with the design process" (Dick & Carey, 1996, p. 256). The Dick and Carey model also illustrates that revision to the goals, analysis, performance objectives, assessment instruments, instructional strategy or instructional materials may be required as a result of the formative evaluation. With rapid prototyping models, evaluation is ongoing, encourages continuous feedback from the customer, starts early in the process and supports the use of the prototype by the customer. Rapid prototypes assist in the discovery of goals by using an analysis-by-synthesis approach to design (Tripp & Bichelmeyer, 1990). With rapid prototyping the expensive and time-consuming revisions occur mainly during the analysis and design phases when it is easier and less expensive to make them.

The Dick and Carey model requires that the instructional designer conduct a summative evaluation. Summative evaluation is conducted after the completion of the development phase and after the instruction has been used for a period and is assumed to be functioning as intended. With rapid prototyping models, summative evaluation is not

obviously indicated as being part of the process; however, it is possible that it may occur.

In summary, it appears that the Dick and Carey model differs from rapid prototyping models in the following ways:

- it may be used by novices;
- it has less concurrent processing of design tasks;
- formative evaluation takes place after the materials are produced; and
- a prototype is not used as part of the evaluation process.

Purpose of the Study

This study validated the use of rapid prototyping methodology as part of the instructional design process. Specifically, it examined the use of the Emdicium rapid prototyping methodology by addressing the following questions:

1. What does the instructional designer/developer do when using the rapid prototyping methodology?
2. What does the customer do when using the rapid prototyping methodology?
3. To what extent does the rapid prototyping methodology reduce the design and development cycle time?
4. To what extent does the rapid prototyping methodology enhance the quality of the instructional product?
5. To what extent and how does the rapid prototyping methodology impact customer satisfaction?
6. To what extent and how does the rapid prototyping methodology impact designer satisfactions?
7. To what extent is the target rapid prototyping model a usable model?

Significance of the Study

Instructional designers are typically considered agents of change. As agents of change, they must find more efficient ways of analyzing, designing, developing, implementing and evaluating instructional materials.

Instructional design theory such as Merrill's ID2 offers a means to design computer-based instruction more quickly through the use of transaction shells. A model that also addresses the issue of rapid construction of paper-based materials is also needed. Based on the success of its use in the software engineering and manufacturing environment, other instructional design teams have used the rapid prototyping methodology when designing instructional materials. However, there is little empirical data that describes how it is being used as an alternative instructional design tool or whether it is effective in reducing cycle time and increasing both product quality and customer satisfaction.

In validating the target rapid prototyping model, this study provides empirical data to determine whether the Emdicium model mirrors what the designers actually do and that rapid prototyping impacts customer satisfaction, cycle time and product quality. In addition, it also serves as one example for others to use when involved in similar model validation efforts.

Limitations of the Study

This research examined one rapid prototyping model and may not extend to other rapid prototyping models. The major limitation of this study was designer and customer recollection. Two of the projects were started and completed during 1995 – 1997; another was started in 1992. The designers and customers had to recall the processes used for

these projects as well the nature of the completed product.

Designer comparisons of rapid prototyping and ISD were based upon personal recollections and perceptions. In addition, the customers in the study were not randomly selected but were selected based on their involvement in the target projects. Neither customer had ever participated in other instructional design projects. Consequently, they were unable to compare the rapid prototyping methodology with another design process. One customer appeared to answer questions with great caution as if afraid to say "the wrong thing." Finally, because of illness, the customer for one project was unable to participate in the study and as a result the study does not contain complete customer information.

Regarding data analysis, a limitation conducting a qualitative study is the subjectivity associated with coding the data. In this study, this researcher's advisor reviewed the coding. Whenever disagreement or concern arose regarding coding, the data was reevaluated and in some instances re-coded.

Definition of Terms

"Customer" in this study includes anyone from the client organization who provides input to the finished product. Internal consultants from the customer organization, subject matter experts and end-users are considered to be the customer. Sometimes the subject matter experts are also instructional designers because of their familiarity with the content. The internal consultant's involvement includes identifying corporate objectives of the project, gaining corporate support for the project and providing content-related information.

"Design Team" consists of subject matter experts, instructional designers,

instructional developers, graphic designers and software programmers. In this study the members of the design team are from both the customer organization and The Emdicium Group, Inc.

"Instructional Designer" in this study does the analysis, design, development, implementation and evaluation based on the customer's need as defined in a needs analysis.

"Rapid Prototyping" is the acceleration of the ISD process by introducing a working model of the final product to users early in the design/development process. Unlike the first draft of a product, which is traditionally presented near the completion of the design phase, the first version of the prototype is introduced early in the design phase after some analysis is conducted. The user's assessment of the prototype provides input, including significant modifications, that can be made prior to product completion without incurring significant cost and squandering time. The rapid prototyping process allows for multiple iteration and fine-tuning to meet the needs of the user and ensure product usability.

Chapter 2

Review of Literature

The review of the literature will describe:

1. the effectiveness of rapid prototyping as a formative evaluation tool;
2. the applications, advantages and disadvantages of the rapid prototyping process;
3. the impact of customer – design team relationships and methods for optimizing such relations; and
4. the use of rapid customer feedback in rapid prototyping.

There is very little empirical research about rapid prototyping as it relates to ISD. The majority of research on rapid prototyping concerns software engineering or manufacturing. There is, however, considerable literature about the application of rapid prototyping in ISD. Consequently, such literature forms the bulk of this review.

Rapid Prototyping as a Formative Evaluation Tool

Two of the research questions of this study dealt with what the instructional design/developer and the customer do when using the rapid prototyping methodology. One of the tasks of the customer and design team is to interact with a working model of the final product – the prototype. The prototype supports the formative evaluation phase of the instructional design project. During the formative evaluation of the prototype the customer can try out the product to determine appropriateness of the user interface, instructional activities, screen design and page layout or content accuracy.

It has been shown that the rapid prototyping methodology can support formative evaluation of the development of a decision support system (DSS). Marcia Murawski's

(1990) research addressed the effects of a scenario on user feedback from a rapid prototype formative evaluation of a DSS to be used by governmental employees. She defines a scenario as a:

> . . . problem designed specifically for a rapid prototype which is representative of the task environment and for which alternative solutions can be determined through the use of the DSS. It is distinguished from an example or problem in that it contains all background, environmental and situational information required to make the problem meaningful for the user. (Murawski, 1990, p.14)

She had an experimental group, referred to as the scenario group and a control group. The scenario group used the scenario as a guide for the review of the prototype DSS. The control group was given a flow diagram of the prototype DSS but used the menu system to guide them through the review. The users reviewed the prototype DSS to determine the availability of input requirements, the quality and number of responses pertaining to the system's input, the quality of the system's output, the utility of the output, the perceived potential of the DSS and recommendations for future development efforts.

Murawski's study was performed to determine the effects the scenario had upon the review of the prototype DSS. The purpose of the prototype DSS was to:

> . . . increase user involvement in order to improve the accuracy and completeness of the information requirements, accomplish mutual commitment and realistic expectations, and facilitate the recognition and resolution to change. (Murawski, 1990, p. 141)

Her findings were:

- the prototype did fulfill its purpose;
- the prototype can support increased user involvement;
- the scenario group appeared to have "a more complete understanding of the rapid prototype and demonstrated more realistic expectations of the development process and the resulting DSS" (Murawski, 1990, p. 143);
- ". . . those without the scenario tended to treat the review more as a software demonstration..." (Murawski, 1990, p. 143);
- the scenario group's changes dealt with program and technology/human factors issues while the control group's changes dealt with systems issues; and
- the use of the rapid prototyping methodology might encourage user/customer enthusiasm because they have the opportunity to interface with a working model throughout the development process.

Murawski recommends using a scenario for the creation of a DSS when the user has time restrictions that pertain to a review. She also says that the "overall implication is that the development and use of a scenario in a rapid prototyping formative evaluation aids in the development of DSS goals" (Murawski, 1990, p. 143). Murawski's study shows that using the rapid prototyping methodology can have a positive influence on the formative review of a DSS.

Martin Tessmer (1994) sees rapid prototyping as an alternative type of evaluation and instructional design. Creating a prototype lets the design team evaluate and revise instruction without investing a lot of effort in design and development. The prototype allows for the substantial revisions that may be required when developing "first time" instruction (Tessmer, 1994). As a design-and-evaluation tool, the prototype would

represent a working portion of the final product for immediate (early in the design process) review by the learners and experts. The instruction is "field tested" while it is being designed and developed (Tessmer, 1994). In some settings, expert reviews are conducted by having the reviewers look at storyboards or scripts. This form of review does not fully portray the product format, instructional design or utilization of the final product.

Some disadvantages of rapid prototyping, as noted by Tessmer, are that they do not include all instructional content or features and consequently require additional learner and expert evaluations when completed. Additionally, the cost of prototyping can be prohibitive in certain settings (e.g., lectures, televised instruction and workshops) if prototyping tools are not developed. Tessmer concurs with Tripp and Bichelmeyer (1990) that rapid prototyping may lead to an undisciplined design-by-repair approach that ignores front-end analysis (Tessmer, 1994). Keeping the advantages and disadvantages in mind, however, Tessmer does believe that rapid prototyping can be used effectively early on in the design process while allowing for early and repeated formative evaluations (Tessmer, 1994).

Like Tessmer, Northrup (1995) also feels that rapid prototyping is a viable strategy for formative evaluation, particularly with multimedia. She also suggests that other formative evaluation strategies be concurrently used in each phase of the instructional design process. For purposes of this review, the discussion will focus on rapid prototyping.

According to Northrup, the design team should work one-on-one with an end user during the design phase to determine the treatment of multimedia and create a prototype

for it. The intent of the prototype is to test attitudes towards the screen layout and design, metaphor, user interface and video quality. While she stresses that the rapid prototype should include video segments it should not include detailed content. Instead the prototype should be descriptive enough for the user to provide initial formative reactions to the product. The benefit of receiving this early feedback is that changes can be made in a cost-efficient manner.

Northrup cautions instructional designers not to confuse the rapid prototyping approach with a prototype evaluation. Rapid prototyping, according to her, is a strategy to test product aspects such as user interface, screen design and flow. The prototype evaluation will have a completed lesson, be used by a small group of individuals from the target audience and will gather not only user performance assessment of the prototype but also attitude toward the product itself. Modifications that are required would be included in the other lessons and when appropriate, documented in the detailed design document.

Applications of Rapid Prototyping

Rapid prototyping has been used for a number of reasons including the following:

- to develop educational software for secondary education programs;
- to simulate a university's registration process; and
- as a research tool to assist in developing instructional strategies and approaches.

With each application of rapid prototyping, the prototype simulates the operation of the intended final product, increases the understanding of software capabilities, supports decision making and is reviewed by the intended users and the project team. The following literature indicates that the prototype functions as a medium for getting information from the users while assisting the designers in developing the final product.

Graells (1993) proposes a methodology for the development of educational software for use in compulsory secondary education programs. This methodology also includes the use of rapid prototyping. Graells' methodology includes:

1. the genesis of the idea or product;
2. the functional design which outlines the pedagogical aspects of the material being produced;
3. a viability study and development plan;
4. completion of the design file;
5. programming and creating the alpha-test prototype;
6. drawing up the written materials;
7. conducting an internal assessment;
8. adjustment and creation of the beta-test prototype;
9. conducting an external assessment with students, teachers and others;
10. adjustment and creation of version 1.0; and
11. publication and program maintenance.

This review will focus on steps 5 - 11.

Step 5 -- programming and creating the alpha-test prototype -- follows the completion of the original design and is divided into two phases: analysis and programming. In the analysis phase, the analysts do an initial design study, analyze the conversion process from paper to computer language, find solutions for developing the structure of the database and define the information tools to be used. The programming phase involves coding the program in accordance with the plan and is divided into two parts. Part one is the creation of a prototype to simulate the operation of the program.

The prototype gives a clearer idea of what the final program will be and is studied by the whole project team. After the study by the project team, alterations may be made to the original design (Graells, 1993). Part two is the creation of the alpha-test version of the program. The alpha-test version of the program is submitted during the internal assessment stage with all the main options of the program, most of the graphics and the greater part of the databases will have been implemented (Graells, 1993). As the alpha-test version is being developed, the designers are developing the written materials (step 6) to accompany the prototype. The internal assessment (step 7) is done by all members of the development team and is conducted as soon as the alpha-test version is available. The purpose of the internal assessment is to evaluate the operation of the program, suggest modifications and make corrections as needed. The internal assessment ensures that the program and its accompanying materials are in accordance with the design specifications and that the technical characteristics (screens, algorithms, communications, environment, databases), pedagogical features (objectives, contents, activities, curricular relevance) and functional assets are satisfactory (Graells, 1993). The program is amended based on the internal assessment and the result is the beta-test version that is basically a finished product (step 8). During step 8, the written materials and teaching media are ready for publication in expectation of the external assessment (step 9). During the external assessment (step 9) the prototype and the materials are tried out with the students and teachers to identify some of the 'possible remaining bugs.' The external assessment ensures that the educational objectives are met and that the program will be well received by its intended users (Graells, 1993). It is possible that modifications will be needed. If time allows and the team deems is necessary, adjustments are made to the program and

materials (step 10). The output of these adjustments is version 1.0 of the program and materials. Version 1.0 software and materials are published, implemented and maintained, as needed in the future (step 11).

Another sample application involves St. Louis University's use of prototyping and simulation as an evaluation and implementation tool for the decisions and design of a student information system. The university used a prototype to orient project teams to software capability, to test database decisions, to understand the product being developed and to transfer the focus from a technical to a user orientation. The prototype simulated the registration process and was used by students and office personnel to test final design, decisions, processes, procedures and documents/forms (Haugen & Nedwek, 1988). The university successfully utilized the prototype to parallel student registration, course scheduling, admissions processing and other university related activities. To develop a final product focus, the prototype was combined with a purchased software package and associated training with systems analysis requirements.

The team at St. Louis University found the prototype to help them affirm the 90/10 rule. The 90/10 rule means that if the prototype design works for 90 percent of the cases, then future time can be focused on the remaining 10 percent of the cases. Lastly, the prototype verified which designs and decisions worked, pointed out what the team needed to know more about, strengthened the team's understanding of the software capabilities and was a true representation of an institutionalized system (Haugen & Nedwek, 1988).

Finally, The Air Force Armstrong Laboratory conducted a project of developing and testing the intelligent automation of the instructional design-and-development process called AIDA (Advanced Instructional Design Advisor). The purpose of the AIDA project

was to improve the quality of computer-based training (CBT) materials while reducing the associated high costs of CBT development (Muraida & Spector, 1993). The designers of AIDA believed that there was a significant shortage of knowledge in this area of instructional courseware design and felt the answer to the shortage was to build a tool that could be used to rapidly prototype and deliver course modules. Additionally, the tool would gather information on authors and students for the purpose of adding to our knowledge of instructional design processes and refining the tool itself (Muraida & Spector, 1993).

The purpose of AIDA was "to assist courseware developers in structuring a computer-based environment which fosters learning" (Muraida & Spector, 1993, p. 240). AIDA makes use of artificial intelligence (AI) or intelligent computer systems because:

> 1. It makes use of an expert system to configure instructional strategies pertinent to a specific task; 2. It provides a development context that is appropriate to a specified learning objective; and 3. It is structured in such a way that it can recognize that it needs additional knowledge and can initiate a process to get the required information. (Muraida & Spector, 1993, p.241)

AIDA supports Merrill's view of second-generation instructional design (ID2) in that it seeks to respond to the limitations of existing instructional design through the use of instructional transactions. A transaction is the interaction between the instructional computing system and the learner. "Transactions encapsulate teaching methods appropriate to specific kinds of subject matter by using preprogrammed strategies which generate a framework or shell that is appropriate for a particular instructional objective" (Muraida & Spector, 1993, p. 242). AIDA was prototyped based on four transaction

shells:

1. identify transaction;
2. interpret transaction;
3. execute transaction and
4. decide transaction.

XAIDA was the Experimental AIDA System component of AIDA and provided a medium for getting information from the users regarding subject matter content and learning environment. It was considered a research prototype. AIDA and the XAIDA prototype assisted designers in the development of optimal instructional strategies and approaches.

Working with the Customer and Design Team

According to Gary and Black (1994) the prototype encourages communication between everyone on the project. Consequently, the working relationship between the customer and design team is an important aspect of the rapid prototyping methodology.

Having good people skills is a quality found in most successful consultants (Dormant, 1986). "People skills" refer to how consultants relate to their customer and consist of beginning this relationship by taking a win-win approach – the customer can trust the consultant to perform the tasks requested. Additionally, it is important to match models. For example, the customer may use a product model in which the subject matter expert (SME) is the authority and the consultant is the producer. The consultant may use a process model in which both customer and consultant collaborate. In such a situation, there is a conflict that must be resolved for the betterment of the project. Characteristics of people skills that help one to remember that customers are people too include the

following:

- studying the customer and the organization to determine unspoken personal and professional needs and wants;
- building common ground by identifying similarities and points of agreement;
- communicating to the customer about the progress of the project as well as respecting the customer; and
- responsibly asserting what you think/require/desire in the working relationship with the customer.

Kathy Indermill (1986) clearly acknowledges that working with the SME is essential, but not always easy. Although her article speaks to trainers who are also course designers and consultants, her suggestions for dealing with SMEs who are hard to work with can apply to anyone working with a SME. Indermill indicates that SME Sclerosis results when SMEs have little confidence in the course designer or consultant and are, therefore, difficult to work with. The outcome of SME Sclerosis is that the course designer or the consultant does not get the appropriate information to develop a competent course.

According to Indermill, about 5 percent of SMEs are easy to work with; that is, a small number of SMEs are clear about what their or the consultant's role is, concise about the expected performance and willing to sit through interviews to provide the appropriate information to develop the course. The other 95 percent can be characterized as Egomaniac, Techy, Snow Job, Doubting Thomas, Type A or The Thinker. While each of these types is unique, they all have the commonality of not trusting the course designer or consultant and not providing the appropriate information.

To overcome these challenges, the consultant will be well served to take the time to nurture the relationship with the customer and make clear the purpose and the process of the interviews that will be forthcoming. To do this, the consultant should do a number of things. The consultant should:

1. establish rapport with the SMEs;
2. let the SMEs know that their time with them will be used efficiently and that their content expertise is appreciated;
3. determine what the SMEs thinks the purpose of the interview is. Then clearly affirm or state the purpose and expected outcomes of the interview. Having an agenda can focus the meeting and let the SME know how much time is required and the process to be followed;
4. state and get agreement regarding her role as a consultant for the project as well as the role of the SME; and
5. describe the working relationship with the SME.

Indermill also recommends that the consultant explain her interview style, get permission to ask questions that may appear stupid while also giving the SME permission to indicate when a question is not relevant, and be aware of the SMEs physical needs during the interview. Additionally, before the actual interview, the consultant should encourage the SME to ask questions and express any concerns. Finally, the consultant should tell the truth about her competence on the project.

Ingram, Heitz, Reid, Walsh and Wells (1994), like others, recognize that instructional technologists are often faced with challenges with working with SMEs. They also acknowledge that instructional technologists must manage the challenges that exist

between themselves and their subject matter experts in order to get their jobs done and have a satisfied customer.

Ingram, Heitz, Reid, Walsh and Wells (1994) present a model for working with a SME that, while intended for new instructional technologists, can also assist experienced instructional technologists. Their model is a four-phased model that includes:

1. preparing to meet with the SME;
2. conducting the meeting with the SME;
3. analyzing the information obtained in the meeting; and
4. developing materials appropriate to where the consultant is in the instructional development process.

Ingram, Heitz, Reid, Walsh and Wells (1994) suggest that the instructional technologist use the four-phased model throughout the project in an effort to maintain a good relationship with the SME. Because the designer and the SME are dependent on one another to complete the project successfully, a good relationship is essential. Having a good relationship will support communication that is two-way rather than one-way. A good relationship should be one of the goals of the instructional technologist.

Using Rapid Prototyping and Integrating End-User Input

In addition to working closely with the consultant, the customer reacts to the prototype to provide feedback regarding design, instructional activities and user interface. The hands-on evaluation via the prototype ensures that the customer's voice is heard throughout the entire project. Several representatives from the user community can do the evaluation of the prototype via focus group sessions, a pilot training session or one-on-one interaction with the prototype.

This research sought to determine to what extent and how the rapid prototyping methodology impacted customer satisfaction. The following literature indicates that the rapid prototyping approach increased the influences of the learners and supported design, development and implementation of the final product. Additionally, the users liked being part of the rapid prototyping process.

Lange and Shanahan (1996) of Arthur Anderson's Industry Education Unit describe the use of rapid prototyping to design a four-day instructor-led school called the Enterprise Group Consulting School. They had four weeks and a $15,000 budget with which to develop the school. The design team consisted of two instructional designers and three content experts.

The Industry Education Unit design team utilized the rapid prototyping approach because it increases the influence of the learners and enables the team to design, develop and implement training within the budget and schedule constraints. Their prototype was their pilot training course, which included materials. The purpose of the pilot training course was twofold. First, they wanted to give the pilot-course learners a sound learning experience, and second, they wanted to generate feedback to be integrated into the next version of the course.

The design team conducted a one-day design meeting. Prior to the meeting one of the team members developed a detailed agenda and a tentative needs assessment. The purpose of the needs assessment was to identify problems that training could solve, define the project's mission, identify participant needs, develop goals, create a list of topics and recommend resources that can be used to develop the course modules.

Once the deliverables and the critical topics were identified, they developed the

materials that would be used for the prototype. The materials developed for the pilot training course consisted of instructor materials and outlines and short module outlines for the participants. The instructors developed their own materials and the instructional designers made sure the materials were consistent in format.

The pilot training course was conducted by eight different instructors and attended by 58 participants. Thirteen separate topics were covered over the four-day period. The pilot training course was also evaluated. As Lange and Shanahan (1996) put it, "Evaluation is the heart of rapid prototyping (p. 28)." Data were collected through observations made by the instructional designers who attended the pilot training course, written evaluations and focus group interviews. Data collected from the written evaluations included rating the topics, indicating whether the course achieved its goals, identifying participant satisfaction as it pertained to having their needs met, citing areas for improvement and deciding whether there was enough hands-on practice. The focus group interviews sought to determine the participant's expectations, impressions, reactions to the topics and suggestions for changes and to gather input about pacing and duration. Six to eight participants were involved in each focus group interview.

The evaluation findings showed that the participants rated the school 3.9 on a 5.0 scale. They received a 91 percent rate of return of written evaluations. Lange and Shanahan stated that the participants enjoyed giving input and that they (the participants themselves) felt they were useful in developing and revising the training course.

The use of the rapid prototyping methodology to design and revise the four-day instructor-led Enterprise Group Consulting School is an example of the use of rapid prototyping with paper-based materials and the effective use of learner (end-user)

interaction. According to Lange and Shanahan (1996), they were able to revise the course to meet the participants' needs within the constraints of the project and with fewer resources. They believe that doing all of this would have taken more time, money and resources if they had used a more traditional model.

Appleman, Pugh and Slantz (1995) demonstrate benefits of utilizing rapid prototyping to develop informal video. Informal video is concerned with clarity of the message and distractions to the students and instructors. The intention is to have balance between what is seen and heard on the screen and the message.

Appleman, Pugh and Slantz (1995) produced 20 hours of low-fidelity videotape that evolved into four prototypes. The first prototype, which was called a rough-sequence prototype, had key scenes that were evaluated in a usability test. The purpose of the usability test was to determine if the sequenced images were clear and the lengths were appropriate. The second prototype was called a rough-cut prototype. It included the sequencing and length changes and was also subjected to a usability test. The usability test evaluated test-labeling conventions, sequencing, pacing and clarity of the message. Based on the rough-cut prototype's usability test, the Alpha Prototype or third prototype was created. The Alpha Prototype included new labels, modified syntax, refined sequencing, introductory comments and an overview section. Subject matter experts reviewed the Alpha Prototype and gave their overall reaction. Further modifications were made to produce the fourth prototype, which was called a Beta Prototype. The Beta Prototype included revisions based on the feedback from the experts. Additionally, it was used to determine whether they would continue refining the material into a final version or whether a new videotape would be generated.

Their usability tests provided the necessary feedback to improve the next iteration of the prototype. The article does not state whether cycle time was reduced but it clearly demonstrates the benefits of evaluating the prototype and the importance of user input when utilizing rapid prototyping.

Law, Okey and Carter (1995) describe another example of capitalizing on end user input. Here rapid prototyping was used to develop an electronic performance support system (EPSS) to support schoolteachers in the use of alternative assessments at all levels of the assessment process. Law, Okey and Carter (1995) described the process, strategies and concepts used to develop the EPSS.

The design team at the Learning and Performance Support Laboratory at the University of Georgia decided that a cased-based approach was the best method for analyzing the issues involved in conducting alternative assessments. They determined that a rapid prototyping methodology would allow the needed flexibility and creativity to get the desired usability standards. Their first prototype was constructed to allow the team to test information/knowledge organization and navigational strategies. They demonstrated the system to a focus group of 15 teachers that taught interdisciplinary units that combined topics from a wide variety of content domains. Some of the teachers also taught multiple grade levels. The demonstration of the prototype elicited feedback from the teachers relating to the delimiting strategy of narrowing down choices based on pre-defined categories. The teachers indicated that the strategy was counter-intuitive and represented opposing ways of thinking about instruction or assessment. Additionally, the teachers did not like the arbitrary selection of grade levels. The teachers requested an interface that was interdisciplinary.

The design team also utilized a design process called formative experimentation, which is a type of research/design which sets a goal and determines what it takes to reach the goal. This process supported the use of the rapid prototype in determining what instructional, cultural and social issues should be considered in getting the teachers to use alternative assessments.

Since the project was apparently not completed at the time their paper was written, conclusions regarding further versions of the prototype were not included. Nonetheless, the paper reveals the importance of using a prototype to elicit user feedback early in the design/development process. The information that resulted from the prototype may not have been discovered until the final product was done if the design team had used a more traditional model.

Summary

Rapid prototyping supports the design and development of instructional products in numerous environments. The interaction with the prototype takes place during the analysis phase, the formative phase of the project and continues through the pilot test. Each interaction with the prototype supports decision-making regarding the effectiveness and design of the final product as well as how the users will react to it. The prototype also helps to identify software capabilities and reduces development cost because a working model is being reviewed rather than a full-scale product.

It appears that a major advantage of the rapid prototyping methodology is the customer involvement because it facilitates the synthesis of the product components. Customer feedback to the instructional designers regarding the prototype supports the development of the final product.

Chapter 3

Procedures

This study sought to validate the use of rapid prototyping as an instructional design/development tool. More specifically, the study assessed the rapid prototyping design model used by The Emdicium Group, Inc. (Emdicium). It was also thought that this study might support an enhanced version of the Emdicium model or generate a new model that could be used to design instructional materials using the rapid prototyping methodology.

Population: The Target Designers of the Study

This study was conducted with three instructional designers from Emdicium. Each participant has used the rapid prototyping process to design and develop instructional materials.

Emdicium was founded in February 1988 as a private consulting firm with the goal of improving performance by analyzing, designing, developing and evaluating performance systems. Emdicium has 14 employees of whom six are involved in the analysis, design, development and evaluation of instructional innovations.

The Emdicium instructional designers/developers have at minimum a Bachelor's Degree and a minimum of eight years experience as instructional designers, trainers, teachers or computer programmers. Each instructional designer has used the Emdicium instructional design model on at least two projects. Table 3 provides information about the Emdicium population for this study.

Emdicium works with approximately 28 contractors on an as-needed basis. The contractors include instructional designers, instructional developers, trainers,

organizational consultants, an editor, a programmer, an artist, a statistician, a training broker, a language translator and a sales consultant.

Table 3
The Emdicium Group, Inc. Participants

Designer	Gender	Age	Responsibility	Education	IT Exp.
#1	Male	47	Senior Designer	Ph.D. Student - Instructional Technology M.L.I.R. – Labor & Industrial Relations M. A. – Industrial Relations B. A. – Psychology & English	14 years
# 2	Female	44	Senior Designer/ Consultant	Ph.D. – Instructional Technology MAT – Reading B. A. – Education	8 years
# 3	Female	49	Instructional Designer, Writer, Editor	B. A. - English & Psychology	24 years

See Appendix A for full resumes.

Although Emdicium is a small organization, it has a global customer list that includes organizations in the United States, United Kingdom and Australia. The Emdicium customer list includes the automotive, financial, telecommunications, health and software development industries. Approximately 75 percent of its business is with the automotive companies based in metropolitan Detroit, Michigan.

Emdicium was selected because of its use of rapid prototyping for the design and development of paper-based and computer-based instructional materials. The Emdicium rapid prototyping model shows the process of presenting the prototype during the design phase in an effort to demonstrate the proposed product. Emdicium projects include designing/developing, implementing and evaluating instructor-led training, computer-

based training, internet/intranet certification testing, hypermedia software as well as conducting needs analysis and performing level-one to level-four evaluation. The duration of their projects varies from four months to three years.

Population: The Target Projects and Customers

The three projects that were researched involved designing and developing instructional materials for customers in the automotive and health industries. The completed projects were selected in an effort to establish customer satisfaction, identify the rapid prototyping process and determine the utility of the finished products.

All of the projects in the study were selected largely because, first, the projects have been completed and, second, the rapid prototyping methodology was utilized. Completed projects were selected in an effort to facilitate the collection of information regarding product utility and customer satisfaction. Emdicium did not use the rapid prototyping methodology prior to 1991. Projects 1 and 2 were started in 1995 and completed in 1997. Project 3 was started in 1991 and completed in 1993. Additional criteria for selection included availability of the Emdicium designer and customer, designer memory and type of deliverable. Because the projects were completed projects, it was believed that the designer might have difficulty in recalling all of the project's circumstances. Consequently, the designers were each asked to select a project in which they used rapid prototyping and were able to recall or review records to assist in recalling the process they followed. Since this study sought to determine the effectiveness of rapid prototyping with computer-based and paper-based projects, the project deliverable was also a consideration. The deliverables included three instructor-led training (ILT) courses including an instructor's guide and electronic presentation, a paper-based user's guide and

a hypermedia with ILT including instructor's guide and participant's guide. In addition to the instructional designers, the study's population included organizational customers such as a training manager/consultant and a user representative known as a subject matter expert that requested the services of the instructional designers.

Table 4 provides information about the projects, designers and customers for this study.

Table 4
Emdicium Customer List

Project	Designer	Project Type and Delivery System	Project Duration	Customer Title and Organization
Project # 1	Designer 1	Instructor-Led Training with electronic presentation, instructor's and participant's guide	4 months	Organization #1
Project # 2	Designer 2	Instructor-Led Training with instructor's guide, participant's guide, on-line tutorial and user's guide	8 months	User Representative/ Organization #2
Project # 3	Designer 3	Hypermedia	24 months	Training Manager/ Organization #2

See Appendix B for organizational information.

Research Design

The nature of the study was Type 2 developmental research utilizing qualitative research methods such as survey and interview. Developmental research is "the systematic study of designing, developing and evaluating instructional programs, processes and products that must meet the criteria of internal consistency and effectiveness" (Seels & Richey, 1994, p.127). There are two types of developmental research – Type 1, with an emphasis on the study of specific product, program design, development and evaluation

emphasis on the study of specific product, program design, development and evaluation projects, and Type 2, with an emphasis on "the study of design, development or evaluation of processes, tools or models" (Richey & Nelson, 1996, p. 1217). The conclusions of Type 1 developmental research are context-specific and include lessons learned. Type 2 developmental research produces generalized conclusions including new design, development and evaluation processes and models along with conditions that promote their use.

Research methodologies of Type 2 developmental research include case study, descriptive analysis, ethnography, evaluation, experiment, observation, qualitative, survey, history and philosophy. The nature of conclusions can be context- or product-specific with or without some generalizations, generalizations with some context or product specifics or just generalizations (Richey & Nelson, 1996). The conclusions can serve to validate a model or technique, illustrate conditions and procedures that promote the use of a model or technique, explain the successes or failures resulting from using a model or technique or to present a new or improved model.

Yin (1984) says that answering "Yes" to the following questions suggests that qualitative research may be appropriate:

1. What is the form of the research question – is it exploratory? Does it seek to describe the incidence or distribution of some phenomena or does it try to explain some social phenomena?
2. Does the research require control over behavior, or does it seek to describe naturally occurring events?
3. Is the phenomenon under study contemporary or historical?

This study sought to describe the incidence of using the rapid prototyping methodology to design and develop instructional materials in a particular work environment – The Emdicium Group, Inc. Rapid prototyping is believed to be a natural technique. People naturally work from the concrete to the abstract to investigate, assimilate and understand new concepts and solve problems. A prototype is concrete and the specifications associated with it are abstract. (Hix & Hartson, 1993) The prototype conveys by showing (i.e., concrete) as opposed to saying (i.e., abstract). The people in the study use the rapid prototyping process as a natural event in designing and developing instructional innovations. This study captured the actual procedure (i.e., natural process) followed when using the rapid prototyping methodology. The use of the rapid prototyping methodology is new and thus contemporary.

Data Collection and Instrumentation for Target Designers

There were five data collection methods in this study: survey/log, face-to-face interview, electronic mail, telephone interview and review of extant data. Each Emdicium employee was given a survey (hereafter referred to as a log) to complete. The purpose of the log was to determine what tasks instructional designers/developers complete on a project using the rapid prototyping methodology. In an effort to facilitate recall of the prototyping process at Emdicium the log included definitions of phases of the design and development cycle. For example, the log identified Emdicium's design process, which includes a design memo, prototype design and review and high-level outline. Additionally, each participant was asked to review any accessible documentation pertaining to the project such as time sheets, design memo, prototype design specifications, memos, final deliverable and the project proposal.

Logs were sent to five Emdicium designers. The instructions in the log directed the participants to respond to appropriate information on the log, skip any item that did not apply and return the log via the U. S. Postal Service or hand delivery by a specified date. (See Appendix C for the Emdicium participants' instrumentation.) Four of the logs were completed and returned but it was determined that only three of the four projects employed the rapid prototyping methodology. To get further explanation about the projects, the Emdicium designers, marketing director, bookkeeper and principals were sent electronic mail requesting input. The requests included questions about whether or not the products were still in use, what types of updates were made to the products, if any, and why they felt the customer was satisfied with the products. They responded via email within a day or two of the requests for additional information. (The requests and responses are found in Appendix H.)

For formative evaluation purposes, the log was completed by a former Emdicium designer who has Instructional Technology experience and has used the Emdicium rapid prototyping methodology. This designer, however, was not part of the study. Feedback from the formative evaluation was used to modify the log.

Following the receipt of each completed log, an audio taped interview was scheduled and conducted with the Emdicium designers. A structured-interview instrument (Appendix D) was used to clarify answers and discrepancies about the process and the impact of the rapid prototyping methodology on the design-and-development process. Additionally, the interview sought to determine product quality based on the usage of the rapid prototyping methodology. The audio tape supported accuracy when analyzing the data. Each interview was approximately one hour long.

The interviews were conducted and transcribed by this researcher. A benefit of conducting the interviews myself was my familiarity with the Emdicium model as well as some of the projects and their deliverables and my ability to asked questions specific to the projects. The structured-interview instrument was used to reduce the chances of biased questioning. The tapes were destroyed after the study's completion.

This researcher is an employee of The Emdicium Group, Inc. and is acquainted with each person who was part of this study. A request was made to each employee to not discuss the study and each participant was assured that they would be given the results of the study upon completion. This researcher was assured that they would not discuss their responses, because they understood the importance of not doing so. Additionally, although the participants work for Emdicium, they each were working at various customer locations during this study rather than sitting side-by-side in the Emdicium office where there is a greater likelihood they would discuss the study.

It is important to note that the names of the Emdicium participants, organizations and customers are not mentioned in the log and have been changed in the transcripts. The names are not mentioned in the results. However, it is quite possible the Emdicium employees and principals will recognize the projects as they review the results. Knowing this information is not detrimental to any one's job and will not have any evaluative effect on their performance.

Data Collection and Instrumentation for Customer/Projects

Four Emdicium customers were contacted and asked to participate in the study. Initially, all four customers agreed to participate; however, the customer from Organization #1 later declined participation due to the need for surgery. Another

customer's interview was destroyed because it was determined that the project did not employ the rapid prototyping methodology. Only two customer interviews were used for this study. During the interviews, it was determined that the two customers participating in the study had never worked on instructional design/training projects before and, consequently, they were not able to answer all questions.

The data collection method for the customer/projects was a telephone interview. An open-ended survey questionnaire was used to structure the telephone interview with the customers. Before the customer interviews were held, each customer was called and asked to participate in the study regarding one project in which Emdicium was the vendor and the rapid prototyping methodology was used. During the initial contact, an appointment was scheduled for the telephone interview. During the 45-minute telephone interview, each customer was asked all of the questions on the survey. Verbal prompts were given to help the customer recall the project circumstances. The interviews with both customers were audio taped with their permission.

For the purposes of this study, the customer consisted of a subject matter expert and a manager. The survey sought to determine product quality, level of customer involvement, customer satisfaction and familiarity with the rapid prototyping methodology. See Appendix E for the telephone interview instrument.

Data Analysis

After receiving the logs and conducting the interviews with both the designers and the customers, QSR Nud*ist qualitative software V4.0 – a registered trademark of Qualitative Solutions and Research Pty Ltd. was used to analyze the data. Nud*ist enabled this researcher to code, sort and analyze the qualitative data in order to answer the

research questions. Coding is the process of "choosing a few categories and marking or noting the text that goes at them so that later all the text on that subject can be retrieved" (QSR Nud*ist User Guide, 1997, p. 58). Once text is coded, questions such as "What do I have on this particular subject?" or "How many people experienced this?" can be answered by retrieving the coded text.

Because coding is subjective, it is helpful to have someone else look at the coding to see if he or she would interpret the data using the same codes that the researcher used. In this study, another person reviewed the coding, disagreements in the coding were discussed and re-coding was done when appropriate.

Once all of the data were analyzed, the tapes from the follow-up interviews were destroyed in an effort to preserve anonymity.

The data came from two sources – customers and designers– and was coded in the following categories:

Customer Categories

- attitude toward rapid prototyping
- cycle time reduction
- nature of customer involvement
- comparison with other models
- customer satisfaction with the
  - rapid prototyping process
  - product
  - product usability

Designer Categories

- attitude toward rapid prototyping
- cycle time
  - reduce
- tasks
  - deliverable
  - identify audience

Designer Categories continued

- attitude toward rapid prototyping
  - increase
  - no change
- comparison with other models
- customer satisfaction with the
  - rapid prototyping process
  - product
- product quality
  - product type
  - usability
- tasks
  - identify instructional need
  - identify content, tasks, process, etc.
  - identify instructional strategies
  - design memo
  - high-level content outline
  - build the prototype
  - prototype review/revise process
  - revisions
  - deliver product

Chapter 4

Results

The purpose of this study was to validate the Emdicium rapid prototyping model. The method for validating the model was through the use of developmental research and qualitative methods. Designers and customers involved in the projects were asked when they use the rapid prototyping methodology, and how they feel the rapid prototyping methodology impacts cycle time, product quality and customer satisfaction. The data in this chapter came from the instructional designers' logs, the instructional designers' follow-up interviews and the customers' telephone interviews. Additional comments were obtained from the Emdicium principals and marketing director. Notes from the researcher regarding the data are indicated in brackets.

The population included three instructional designers and two customers. Instructional Designers # 2 and #3 have used the rapid prototyping methodology since 1992; Instructional Designer #1 has used it since 1995. All three of the instructional designers have been designing instructional products for several years. Designers #1 and #2 are Emdicium employees, and Designer #3 is a freelance employee with Emdicium. The projects in the study had teams that ranged in size from six to twenty-five people, with deliverables that were paper-based and electronic. All projects employed the rapid prototyping methodology.

Both of the customers who participated in the study were from Organization #2 and had not worked on instructional design projects that used the rapid prototyping methodology. Nor had they worked on projects that had a hypermedia or on-line tutorial as a final product. In fact, the customer from Project #3 described the project as one that

was covering new ground. His role in the project was that of consultant-training manager hired by Organization #2. His role was to represent Organization #2, the training community and engineering. In this role he coordinated the efforts to get subject matter experts, identified and confirmed the processes being documented and made sure the content was correct.

The customer from Project #2 was an end-user representative of the organization. He was on the project to ensure that the users could interface easily with the product and to help determine content.

This chapter will present the findings of the research as they relate to each research question.

Research Question 1.

What does the instructional designer/developer do when using the rapid prototyping methodology?

The data for Research Question 1 came from the designers' logs, the designers' follow-up interviews and the customers' telephone interviews. The target model shows what the designers should do on instructional projects, and the data in the logs and interviews shows what they actually did.

According to the Emdicium rapid prototyping model and brochure, the designers have up to 14 tasks that they may perform while on a project. The 14 tasks prescribed in the Emdicium model are indicated in Table 5. In this study of three rapid prototyping projects, the findings indicate that the designers perform 90.5 percent of the rapid prototyping tasks.

Table 5
Rapid Prototyping Tasks in the Emdicium Model

1. Identify the audience
2. Identify instructional need
3. Identify content, tasks, processes
4. Identify instructional strategies
5. Write the design memo
6. Write the high-level content outline
7. Identify the content for the prototype
8. Build the prototype
9. Review the prototype
10. Get agreement regarding the prototype and freeze the content
11. Write the remaining components
12. Pilot the product
13. Revise the product based on the pilot
14. Deliver the product to the customer

Following are tables that illustrate what each instructional designer actually did on each project.

Table 6 provides the details for what Instructional Designer #1 did on his project. The data in this table are from the instructional designer's log and follow-up interview, when further explanation is deemed appropriate. The table also indicates working days on the project when the designer provided it. N/A in the table means the designer did not provide the number of days worked on a given task. Notes from the researcher are indicated in brackets. The final product for Project #1 was a one-day course that included

a Reference Guide, Instructor's Guide, Participant Activities and a PowerPoint presentation. Instructional Designer #1 spent 74 working days on his project and performed all of the tasks indicated in the Emdicium rapid prototyping model and brochure.

Table 6
A Description of Project #1 Design and Development Tasks Based on Designer Log Entries and Follow-Up Interviews

Prototype Tasks	What Designer Did	Days
1. Identify Audience	Log: All Organization #1 employees were identified by the sponsor.	N/A
2. Identify Instructional Need	Log: Based on management perception that employees needed an orientation on Organization #1 products.	1
3. Identify Content, Tasks, Processes	Log: Interviewed 1 subject matter expert initially, then 11 SMEs.	N/A
4. Identify Instructional Strategy	Log: We initially decided to present the course and information in one way. As it evolved the general structure emerged and the best means for conveying evolved and were reviewed with the sponsor.	14
5. Write Design Memo and Get Approval	Log: This [design memo] and an outline of content were included. Interview: The general structure emerged and the best means for conveying evolved and were reviewed with sponsor.	N/A
6. Write Outline	Log: Wrote the high-level outline, which continued to evolve up to the pilot.	N/A
7. Identify Prototype Content	Log: Discussion with project team and consensus agreement.	5
8. Build Prototype	Log: Project team (client) wanted more than one format for the instructor's guide, as well as developed overheads, learner's guide and product reference guide	5

Table 6 continued
A Description of Project #1 Design and Development Tasks Based on Designer Log Entries and Follow-Up Interviews

Prototype Tasks	What Designer Did	Days
9. Review Prototype	Log: Had some difficulty arranging convenient time for team to review. Ultimately, there was considerable disagreement over instructor's guide style among team members. Made several revisions and had several reviews. Notion of doing a detailed reference resulted from prototype reviews. Interview: Several meetings for review of the instructor's guide and user's guide.	10
10. Get Agreement and Freeze Content	Log: Finally achieved consensus on look and feel for instructor's guide, learner's guide, reference guide and overheads. Content was only thirty percent (30%) complete. Interview: The learner's guide format froze after prototype. The screen designs the general formatting for the PowerPoint froze after prototyping. The instructor's guide was not frozen. The reference guide was not frozen.	10
11. Write Remaining Components	Log: Major challenge was [working on the] instructor's guide format and [the] extreme [amount of] detail in reference guide.	21
12. Conduct Pilot	Log: Conducted with audience composed of instructional staff, management representatives, target audience representatives. Good feedback to enable revisions. Interview: When dealing with the prototype we really field tested the instructor's guide format, the learner's guide format and one section of the content. One small section of content to see how that would come across. And if there was . . . you know any kinds of distinctions we wanted . . .we field tested by having the instructor actually teach about a 2 hour segment to a range of what would be the audience. We had SMEs, we had other instructors and part of the instructional staff and we had a couple of potential users.	1

Table 6 continued
A Description of Project #1 Design and Development Tasks Based on Designer Log Entries and Follow-Up Interviews

Prototype Tasks	What Designer Did	Days
13. Make Product Revisions	Log: Modified the instructor's guide. Minor changes to reference guide. Changed two activities to increase interactivity and reduce time. Interview: ... in fact everything changed. Part of that was because it became political. ... we were honing in on one or two products and all of sudden not only did we have to provide something on all the products but we also had to do a section on the services. So now we had a unit on product. We had a unit on services. ... and the materials all changed. ... even the look and feel. Well I don't think the learner's guide changed. We maintained our same format on that which was our basic PowerPoint you know learner's guide type format. But including the reference guide ... and the reference guides they changed considerably from the prototype.	5
14. Deliver Product	Log: Involved participating in first run of course and monitoring learner reactions. All materials and masters given to client	1
	Project #1 Total Working Days	74

Table 7 shows the tasks and the duration of each task that was on the designer's logs and in the transcripts for Project #2. The data in this table was from the instructional designer's log and follow-up interview, when further explanation is deemed appropriate. Notes from the researcher are indicated in brackets. The table also indicates working days on the project when the designer provided it. N/A in the table means the designer did not provide the number of days worked on a given task. The final products for Project #2 were a one-day instructor-led course with a combination reference/user's guide, participant's guide, instructor's guide and on-line job aid. Instructional Designer #2 spent 78.25 working days on her project and performed all of the tasks indicated in the

Emdicium rapid prototyping model and brochure.

Table 7
A Description of Project #2 Design and Development Tasks Based on Designer Log Entries and Follow-Up Interviews

Prototype Tasks	What Designer did	Days
1. Identify Audience	Log: During analysis phase gathered info re: audience, who they were and how they would use new system – how they would be affected by change.	N/A
2. Identify Instructional Need	Log: Over a period of 2-3 weeks, we met with the customer to discuss training needs and analyzed the system to learn how it worked and what users would need to know about the system.	10
3. Identify Content, Tasks and Processes	Log: This was part of the analysis; gather content.	4
4. Identify Instructional Strategies	Log: This was part of the analysis phase. Produced an analysis report, which eventually became a training plan. Interview: Instructional strategies included on-line job aid, reader's on-line tutorial, classes with an instructor's guide, participant's guide and user's guide.	12
5. Write Design Memo and Get Approval	Log: We gathered content and produced a design concept memo. Interview: The design concept memo is done many times with the client sitting there with you. We gathered content and produced design memo.	8.5
6. Write Outline	Log: Not applicable. Interview: We didn't do a high-level content outline. . . . was I did an outline for the user's guide. Maybe that's the high-level content outline.	N/A
7. Identify Prototype Content	Log: Not applicable. Interview: We just pulled one section from the design concept memo. . . . It was [one section of] the user's guide and the very first section for the instructor's	N/A

Table 7 continued
A Description of Project #2 Design and Development Tasks Based on Designer Log Entries and Follow-Up Interviews

Prototype Tasks	What Designer did	Days
	guide for the stand-up class .for the job aid and on line tutorial.	
8. Build Prototype	Log: We had design meetings, wrote objectives, user's guide table of contents, templates, standards.	5.25
9. Review Prototype	Log: Reviewed user's guide with client. Interview: It was a gang review meeting in which we went over changes and markups...They didn't care what it looked like . . . they looked a little bit for content. . . .only one version of the prototype.	0.25
10. Get Agreement and Freeze Content	Log: Not applicable – [all of this] happened at the review meeting. Interview: We made changes to systems procedures but the system was not done yet. The business process was frozen. The content for the instructor's guide and user's guide was frozen. The participant's guide had the scenarios and the user's guide was a reference document with procedures and how to's	N/A
11. Write Remaining Components	Log: User's guide development – we revised as needed, captured graphic screens for the on-line job aids. (17 days) Facilitator/instructor's guide development - design and content review, edits and review meetings (5 days)	22
12. Conduct Pilot	Log: [We did a] course pilot with SMEs. Used a completed facilitator's guide, participant's guide and user's guide. This task included prep for the pilot. (pilot – 2d; prep - 8.25d)	10.25
13. Make Product Revisions	Log: [There were] revisions to the facilitator's guide. Revisions to user's guide included screen captures, graphics planning for the user's guide. Interview: The types of revisions included content, interface, graphics, etc. (Facilitator's guide-3.5d; user's guide-2.0d; graphics planning- 0.5d)	6.0
14. Deliver Product	Log: Customer loved product. Course was delivered with minor modifications (system changes and updates)	N/A

Table 7 continued
A Description of Project #2 Design and Development Tasks Based on Designer Log Entries and Follow-Up Interviews

	from January 1995 to August 1997. User's guide was recently modified and updated with very little change to layout – needed to add all new screens – new system.	
		Project #2 Total Working Days 78.25

Table 8 shows the tasks Instructional Designer #3 did on her project, including total working days. The data in this table was from the instructional designer's log and follow-up interview, when further explanation is deemed appropriate. The table also indicates working days on the project when the designer provided it. N/A in the table means the designer did not provide the number of days worked on a given task. Notes from the researcher are indicated in brackets. The final product for Project #3 was a hypermedia module consisting of topics, tasks and a glossary. Instructional Designer #3 spent 41 working days on her project. Instructional Designer #3 did not perform all of the tasks indicated in the Emdicium rapid prototyping model and brochure; however, these tasks were performed by other individuals working on the project.

Table 8
A Description of Project #3 Design and Development Tasks Based on Designer Log Entries and Follow-Up Interviews

Prototype Tasks	What Designer did	Days
1. Identify Audience	Log: I did not participate in this task.	N/A
2. Identify Instruct-ional Need	Log: I did not participate in this task.	N/A
3. Identify Content,	Log: Project #3: I interviewed the SME (there was only one) and reviewed materials documenting the Project #3	.5

Table 8 continued
A Description of Project #3 Design and Development Tasks Based on Designer Log Entries and Follow-Up Interviews

Prototype Tasks	What Designer did	Days
Tasks and Processes	Engineering Sign-Off process. The process itself was being developed simultaneously with the training.	
4. Identify Instruct-ional Strategies	Log: I was not involved in selecting the overall instructional strategy, stand-up training. Instructional strategies were, for the most part, dictated by the SMEs and the strategies used in earlier training. In addition, a British company was contracted to build a "team-building" component into each Project #3 topic. The resulting design was a combination of existing materials and their materials. In terms of my work, there was no original design involved. Interview: I did design the structure, interactivity and appearance of the Engineering Sign Off materials	2
5. Write Design Memo and get Approval	Log: I was not involved in writing the overall design concept for the Project #3 training. However, I did write a design memo for the each topic I developed (it was a required part of the development process). Approval of the design memo launched development of the first online prototype (described on the first page of this file). Interview: Just a description of the treatment which probably said it would consist of one overview module and 4 detailed modules and that kind of thing for treatment. The most important part of that design memo was the high level content outline which was the structure. We were trying to get approval of the structure before we got to the prototype.	2
6. Write Outline	Log: The high-level content outline was included in the design memo. When the client approved the design (structure and treatment), he also approved the outline	N/A
7. Identify Prototype Content	Log: I obtained content for prototypes during or shortly after my SME review of the design memo (as I recall, for Engineering Sign-Off, additional resource material was handed over at that time). Approval of the design memo launched development of the prototype itself with no further research. For other hypermedia topics, approval of the design memo launched scheduling of more in-depth research	N/A

Table 8 continued

A Description of Project #3 Design and Development Tasks Based on Designer Log Entries and Follow-Up Interviews

Prototype Tasks	What Designer did	Days
8. Build Prototype	Log: There was a prototype for every topic that I did. The prototype had a specific definition: a working set of files that included all main screens with high-level text, all popup boxes and detail screens with a description of what they would contain, a verbal description of all graphics and sketched storyboard of all graphics...building the prototype involved writing, testing and debugging	10
9. Review Prototype	Log: The prototype was reviewed by formally presenting it online to the SME. The SME had the opportunity to click through the material and comment on the content, appearance and functionality. During this review, the SME provided additional detailed source material to be used in writing popup box and detail screen content. There were very few (if any) changes to the prototype during this review. Interview: The subject matter expert reviewed and gave approval of the prototype.	.5
10. Get Agreement and Freeze Content	Log: For Engineering Sign-Off, SME agreement with the prototype (after the prototype review) constituted freezing the high-level content. Based on the prototype review, the SME provided additional detailed source material to be used to fill in popup boxes and detail screens. Interview: You know it was a missing period here and a typo there and you know we'll do something with that picture and just such minor tweaks.	N/A
11. Write Remaining Compon-ents	Log: There were no remaining components in the Project #3 assignment. However, I did have to write full first and second drafts that included filling in the popup boxes and detail screens and inserting the completed graphics. The interface appearance and functionality needed no further work, as they were developed and debugged in the high-level prototype. Interview: There were two things I guess you could call remaining components. There were glossary terms that	15

Table 8 continued
A Description of Project #3 Design and Development Tasks Based on Designer Log Entries and Follow-Up Interviews

Prototype Tasks	What Designer did	Days
	needed to be added to the overall glossary for hypermedia. And . . . a 5-page . . . hypermedia summary that went in the introductory module. Those were the two adjunct things and that was true for all of the modules. . . . However, I did have to write full first and second drafts that included filling in the popup boxes and detail screens and inserting the completed graphics. The interface appearance and functionality needed no further work, as they were developed and debugged in the high-level prototype.	
12. Conduct Pilot	Log: Project #3 pilots were a release step. A release involved identifying all the topics that would be included in the release, adding all new terms to the glossary, adding a topic summary for each released topic to the Organizer Module, linking new topics to the Organizer Module, linking new topics to each other, linking new topics to all previously-released topics. Individual topics were not piloted. The release was piloted. A release normally included three or four new topics. Interview: Some of them were the SMEs. We walked up and talked to the people, watched what they were doing; were there to answer their questions. . . . People were invited to attend. So we got to watch them.	1
13. Product Revisions	Log: Revision after a release pilot normally included fixing typos and bugs. It did not involve adding new content. SMEs were invited to attend the pilot, but pilots were primarily conducted with representative users.	10
14. Deliver Product	Log: I did not participate in this task. Interview: I know we had 15 out there and I know that I believe that there were 17 developed. But I don't think we ever had that final release. I know that I developed one module that was never released because we didn't do. . . never had that final . . . release because Organization #2 didn't approve . . . there were modules that were supposed to be developed but they just . . . it never went forward. There was one hanging out there.	N/A

Table 8 continued
A Description of Project #3 Design and Development Tasks Based on Designer Log Entries and Follow-Up Interviews

Prototype Tasks	What Designer did	Days

Project #3 Total Working Days 41

After each designer completed a log describing what tasks were performed when using the rapid prototyping methodology, a follow-up interview was conducted. The purpose of the follow-up interview was to get further explanation on information written in the log. During the follow-up interview, each designer was asked to elaborate on certain tasks that they indicated they had completed. For example, when asked in the follow-up interview to elaborate on his review sessions, Designer #1 said:

> We field-tested by having the instructor actually teach about a two-hour segment to a range of what would be the audience. We had SMEs, we had other instructors and part of the instructional staff and we had a couple of potential users. For the most part it was the audience though and in part it was instructional staff. . . (Transcript 001, Lines 85 - 87)

When asked to describe her review sessions, Designer #2 said:

> . . . with a gang review where we just sat down. I think we did it in here . . . We just went around the table and we just went through it. We passed it out to them before hand and they went through it and made any mark ups and . . . any anticipated changes. And . . . basically they weren't into layout. They didn't care what it looked liked. . . . that was always the impression I got, that as long as it was clean and it contained content that was accurate. (Transcript 002, Lines 90 –

96)

Designer #3 indicated that for her product review, "People were invited to attend. So we got to watch them too" (Transcript 003, Line 254).

The Emdicium model includes the analysis, design, development and delivery phases for their projects in addition to a sales phase. The analysis phase includes identifying the audience, identifying instructional need, identifying content and identifying instructional strategy. The design phase includes writing the design memo and reviewing it with the customer, writing high-level outline, identifying prototype content, building a prototype, reviewing the prototype and freezing content. The development phase includes writing the remaining components, conducting the pilot and revising the product. The delivery phase includes giving the customer the final product(s). While working on their projects, the designers worked on more than one task simultaneously throughout the analysis, design and development phases of their projects. At Emdicium, the process of working on more than one task simultaneously is called parallel tasking. Table 9 lists each rapid prototyping task along with the task(s) that were completed simultaneously, as indicated on the designer's logs. For example, on Project #2 the instructional designer identified the instructional need and identified content, tasks and processes while identifying the audience.

Table 9
Emdicium Rapid Prototyping Tasks Conducted Concurrently

Project Tasks	Parallel Tasks		
	Project 1	Project 2	Project 3
1. Identify Audience	• Identify Instructional	• Identify Instructional	Target Task Not Completed By The

Table 9 continued
Emdicium Rapid Prototyping Tasks Conducted Concurrently

Project Tasks	Parallel Tasks		
	Project 1	Project 2	Project 3
	Need	Need • Identify Content, Tasks And Processes	Designer
2. Identify Instruction-al Need	• Identify Audience	• Identify Audience • Identify Content, Tasks and Processes	Target Task Not Completed By The Designer
3. Identify Content, Tasks and Processes	• Identify Instructional Strategies	• Identify Audience • Identify Instructional Need	No Concurrent Task
4. Identify Instruction-al Strategy	• Identify Content, Tasks and Processes	• Identify Audience • Identify Instructional Need	No Concurrent Task
5. Write Design Memo and Get Approval	No Concurrent Task	• Identify Content, Tasks and Processes	• Identify Prototype Content
6. Write High-Level Outline	No Concurrent Task	No Concurrent Task	• Write Design Memo and Get Approval
7. Identify Prototype Content	No Concurrent Task	• Identify Content, Tasks and Processes	• Write Design Memo and Get Approval
8. Build Prototype	No Concurrent Task	• Identify Content, Tasks and	• Identify Prototype

Table 9 continued
Emdicium Rapid Prototyping Tasks Conducted Concurrently

Project Tasks	Parallel Tasks		
	Project 1	Project 2	Project 3
		Processes	Content
9. Review Prototype	• Identify content, tasks and processes	No Concurrent Task	No Concurrent Task
10. Freeze Content	• Identify content, tasks and processes	No Concurrent Task	• Identify Content, Tasks and Processes
11. Write Remaining Compon-ents	• Identify content, tasks and processes	No Concurrent Task	• Identify Content, Tasks and Processes
12. Conduct Pilot	No Concurrent Task	No Concurrent Task	No Concurrent Task
13. Revise the Product	No Concurrent Task	No Concurrent Task	No Concurrent Task
14. Deliver Product	No Concurrent Task	No Concurrent Task	No Concurrent Task

The designers worked on different projects with different final products. The time they spent completing each task varied, as indicated in Table 10. For example, the average number of days to identify content, tasks and processes was 6.17 with a standard deviation of 5.72. It took an average of 3.58 days to review the prototype with a standard deviation of 4.54. The variation of average days spent on a task is significant. The large variation may be due to the type of final product that was produced or to the level of experience with using the Emdicium rapid prototyping methodology.

Table 10
Average Time Spent on an Emdicium Rapid Prototyping Task

Project Tasks	Designer #1 Working Days	Designer #2 Working Days	Designer #3 Working Days	Average Working Days	Standard Deviation
1. Identify Audience	1			1.00	0.00
2. Identify Need		10		10.00	0.00
3. Identify Content, Tasks and Processes	14	4	0.5	6.17	5.72
4. Identify Instructional Strategy		12	2	7.00	5.00
5. Write Design Memo and Get Approval		8.5	2	5.25	3.25
6. Write High-Level Outline	5			5.00	0.00
7. Identify Prototype Content	5			5.00	0.00
8. Build Prototype	10	5.25	10	8.42	2.24
9. Review Prototype	10	0.25	0.5	3.58	4.54
10. Freeze Content	21			21.00	0.00
11. Write Remaining Components	1	22	15	12.67	8.73
12. Conduct Pilot	5	10.25	1	5.42	3.79
13. Revise the Product	1	6	10	5.67	3.68

Table 10 continued
Average Time Spent on an Emdicium Rapid Prototyping Task

	Designer #1 Working Days	Designer #2 Working Days	Designer #3 Working Days	Average Working Days	Standard Deviation
14. Deliver the Product	1				
Totals	74	78.25	41	64.42	16.65

The Emdicium designers collectively spent 22 percent of their time doing analysis. They spent 40 percent of their time doing design and 37 percent of their time was spent doing development. See Figure 5.

Figure 5. Percentage of Cycle Time Spent in Phases for All Designers

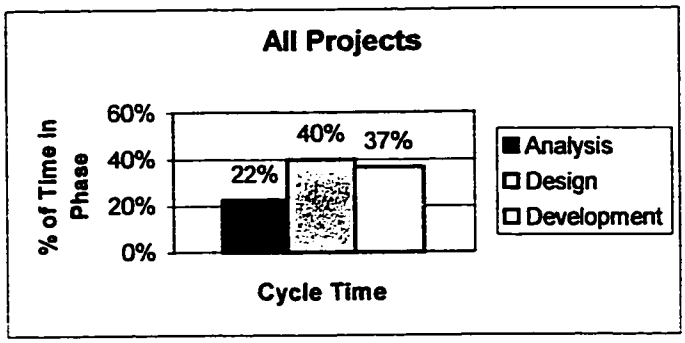


Table 11 details the tasks completed for each instructional design phase in the Emdicium rapid prototyping methodology.

Table 11
Instructional Design Phases in the Emdicium Rapid Prototyping Methodology

Analysis Phase	Design Phase	Development Phase	Delivery Phase
• Identify Audience	• Write Design Memo and Get Approval	• Write Remaining Components	• Deliver Final Product to the Customer

Table 11 continued
Instructional Design Phases in the Emdicium Rapid Prototyping Methodology

Analysis Phase	Design Phase	Development Phase	Delivery Phase
• Identify Instructional Need • Identify Content, Tasks and Process • Identify Instructional Strategies	• Write High-Level Outline • Identify Prototype Content • Build Prototype • Review Prototype • Freeze content	• Conduct Pilot • Revise the Product	

Individually their time was spent quite differently, as indicated in Table 12. Designer #1 spent 69 percent of his time in the design phase. Designer #2 and Designer #3 spent most of their time in the development phase – 48 percent and 63 percent respectively.

Table 12
Individual Designer Time in Rapid Prototyping Phases

Designer #1	Designer #2	Designer #3
• Analysis – 20% (15 days) • Design – 69% (51 days) • Development – 9% (7 days)	• Analysis – 33% (26 days) • Design – 18% 14 days) • Development – 48% (38.25 days)	• Analysis – 6% (2.5 days) • Design – 30% (12.5 days) • Development – 63% (26.0 days)

Table 13 details the working days and percentage of time the Emdicium designers spent individually and collectively during each phase of the project.

Table 13
The Percentage of Time the Designers Spent Doing Analysis, Design and Development

	Designer #1 Working Days	Designer #2 Working Days	Designer #3 Working Days	Average Days	Standard Dev-iation	Total Days for All Projects	% for All Projects
Analysis Phase							
1. Identify audience	1.0			1.00	0.00		
2. Identify instruct-ional need		10.0		10.00	0.00		
3. Identify content, tasks and processes	14.0	4.0	0.5	6.17	5.72		
4. Identify instruct-ional strategy		12.0	2.0	7.00	5.00		
Total analysis time	15.0	26.0	2.5			43.5	22%
Percent of Total Time	20%	33%	6%				
Design Phase							
5. Write Design Memo and Get Approval		8.5	2	5.25	3.25		
6. Write High-Level Outline	5.0			5.00	0.00		
7. Identify Proto-type Content	5.0			5.00	0.00		

Table 13 continued
The Percentage of Time the Designers Spent Doing Analysis, Design and Development

	Designer #1 Working Days	Designer #2 Working Days	Designer #3 Working Days	Average Days	Standard Deviation	Total Days for All Projects	% for All Projects
8. Build Prototype	10.0	5.25	10.0	8.42	2.24		
9. Review Prototype	10.0	0.25	0.5	3.58	4.54		
10. Freeze Content	21.0			21.00	0.00		
Total Design Time	51.0	14.0	12.5			77.5	40%
Percent of Total Time	69%	18%	30%				
Development Phase							
11. Write Remaining Components	1.0	22.0	15.0	12.67	8.73		
12. Conduct Pilot	5.0	10.25	1.0	5.42	3.79		
13. Revise the Product	1.0	6.0	10.0	5.67	3.68		
Total Development Time	7.0	38.25	26.0			71.25	37%
Percent of Total Time	9%	48%	63%				
Delivery							
14. Deliver the Product	1.0	1.0					
Totals	74	79.25	41	64.75	16.93	194.25	

Research Question 2.

What does the customer do when using the rapid prototyping methodology?

According to the designers' logs and the customers' interviews, the designer and the customer worked together at different points during the analysis phase, the design phase and the development phase. Although the customer's role varies from project to project, it appears that the customer is involved in many of the tasks. For example, Designer #1 indicated that the instructional strategies' " . . . general structure emerged and the best means for conveying evolved and was reviewed with sponsor" (Log 001, Lines 38 - 39). However, the customer was not involved in identifying instructional strategies with Designer #2 or Designer #3.

Each customer was asked if he and the members of the customer team participated in the review of the prototype and each responded "Yes." The customer from Project #2 indicated the following:

> It varied, you know. As far as the user representatives there were at time let's see one, two (pause), I'd say from as high as six from down to as low as about three or four" (Transcript 002A, Lines 145 - 147).

The customer from Project #3 indicated that end-users and subject matter experts were involved in the review of the prototype. Table 14 has statements that illustrate the type of involvement that the customers had on the target projects. The statements are taken from the designers' logs and follow-up interviews along with a couple of statements taken from the interviews with the customers. Notes from the researcher are in brackets.

Table 14
Customer Involvement in Emdicium Rapid Prototyping Methodology Tasks

Rapid Prototyping Tasks	Customer Involvement		
	Project #1	Project #2	Project #3
1. Identify Audience		Over a period of 2-3 weeks we met with the customer to discuss training needs and analyzed the system to learn how it worked and what users would need to know about the system. (Log 002, Lines 19 – 21)	
2. Identify Instruct-ional Need		(See Task #1)	
3. Identify Content, Tasks and Processes	Started with a single, knowledgeable SME. This provided scope. He left company before project completion. Then had to rely upon SME for each topic area – 11 in all. (Log 001, Lines 30 – 32)	(See Task #1)	
4. Identify Instruct-ional Strategy	The general structure emerged, and the best means for conveying evolved and was reviewed with sponsor. (Log 001, Lines 38 – 39)		
5. Write Design Memo and Review		. . . the design concept memo is done many times with the client sitting there with you. We	

Table 14 continued
Customer Involvement in Emdicium Rapid Prototyping Methodology Tasks

Rapid Prototyping Tasks	Customer Involvement: Project #1	Project #2	Project #3
with Customer		did that. (Transcript 002, Lines 384 – 386)	
6. Write High-Level Outline			When the client approved the design (structure and treatment), he also approved the outline. (Log 003, Lines 72 –73)
7. Identify Proto-type Content	Discussion with project team and consensus agreement. (Log 001, Line 57)		Sometimes there was more than one subject matter expert than the person that I was . . . meeting with initially to get the initial structure . . . work done. Then he gave me the names of the engineers. (Transcript 003, Lines 93 – 95)
8. Build Proto-type		We had design meetings, wrote objectives, user's guide table of contents, templates, standards. (Log 002, Lines 64 – 65)	
9. Review Proto-type	Had some difficulty arranging convenient time for team to review. Ultimately, there was considerable disagreement over	Reviewed user's guide with client. It was a gang review meeting in which we went over changes and markups. Some content was	The prototype was reviewed by formally presenting it online to the SME. The SME had the opportunity to click through the

Table 14 continued
Customer Involvement in Emdicium Rapid Prototyping Methodology Tasks

	Customer Involvement		
Rapid Prototyping Tasks	Project #1	Project #2	Project #3
	instructor's guide style among team members. Made several revisions and reviews. (Log 001, Lines 70 – 72)	reviewed. (Log 002, Lines 75 - 76) Yes, definitely [subject matter experts and end-users reviewed the prototype]. (Transcript 002A, Line 89)	Material and comment on the content, appearance and functionality. During this review, the SME provided additional detailed source material to be used in writing Popup-box and detail-screen content. There were very few (if any) changes to the prototype during this review. (Log 003, Lines 111 – 116) Users and so-called subject matter experts [were involved in the review sessions]. (Transcript 003A, Line 155)
10. Freeze Content	Finally achieved consensus on look and feel for instructor's guide, learner's guide, reference guide and overheads. (Log 001, Lines 79 - 80)	This happened at the review meeting. (Log 002, Line 86)	For Engineering Sign-Off, SME agreement with the prototype (after the prototype review) constituted freezing the high-level content. Based on the prototype review, the SME provided additional detailed source material to be used to fill in popup

Table 14 continued
Customer Involvement in Emdicium Rapid Prototyping Methodology Tasks

	Customer Involvement		
Rapid Prototyping Tasks	Project #1	Project #2	Project #3
			Boxes and detail screens. (Log 003, Lines 125 - 128)
11. Write Remaining Components	Major challenge was instructor's guide format and extreme detail in reference guide. . . . collect content – review and revise with multiple SMEs. (Log 001, Lines 87 - 90)	User's guide development -- we revised, as needed, captured graphic screens for the on-line job aids. Facilitator/ instructor's guide development - design and content review, edits and review meetings. (Log 002, Lines 97 - 99)	
12. Conduct Pilot	Conducted with audience composed of instructional staff, management representatives and target audience representatives. Good feedback to enable revising. (Log 001, Lines 94 - 96)	[We did a] course pilot with SMEs. Used a completed facilitator's guide, participant's guide and user's guide. (Log 002, Lines 106 – 107)	Then that unit was delivered to the users or distributed . . . sometimes via diskette and sometimes via Organization #2's network. The pilot you know it was a pilot of the release not a pilot of the individual modules. . . . And also we had visual feedback because we had a room full of people. Umm some of them were the SMEs. We walked up and talked to the people, watched what they were doing, were

Table 14 continued
Customer Involvement in Emdicium Rapid Prototyping Methodology Tasks

Rapid Prototyping Tasks	Customer Involvement Project #1	Project #2	Project #3
			There to answer their questions. . . . People were invited to attend. So we got to watch them too. (Transcript 003, Lines 231 – 254)
13. Revise the Product	There were some specific comments, recommendations, [and] a lot of issues around content [from the client group]. Specific things about how certain products were represented or there were questions about the accuracy of certain things in the . . . reference guide. (Transcript 001, Lines 144 - 147)	. . . when we did the pilot test with them . . . that was mostly with the class. With the user's guide to support it. . . . and then we made any revisions based on that. (Transcript 002, Lines 172 - 175)	Revision after a release pilot normally included fixing typos and bugs. It did not involve adding new content. SMEs were invited to attend the pilot, but pilots were primarily conducted with representative users. (Log 003, Lines 166 - 168)
14. Deliver Product			

Table 15 summarizes the tasks that the designers and customers completed when using the rapid prototyping methodology on the projects in the study. The information in Table 15 was taken from the data on the designer's log and from some of the responses from the customers on Project #2 and Project #3.

Table 15
Project Summary of Emdicium Rapid Prototyping Tasks Completed by the Designer and Customer

Rapid Prototyping Designer and Customer Tasks	Project #1		Project #2		Project #3	
	Dsgn	Cus	Dsgn	Cus	Dsgn	Cus
1. Identify Audience	X		X	X		
2. Identify Instructional Need	X		X	X		
3. Identify Content, Tasks, and Processes	X	X	X	X	X	
4. Identify Instructional Strategy	X	X	X		X	
5. Write Design Memo and Review with Customer	X		X	X	X	
6. Write High-Level Outline	X		X		X	X
7. Identify Prototype Content	X	X	X		X	X
8. Build Prototype	X		X	X	X	
9. Review Prototype	X	X	X	X	X	X
10. Freeze Content	X	X	X	X	X	X
11. Write Remaining Components	X	X	X	X	X	
12. Conduct Pilot	X	X	X	X	X	X
13. Revise the Product	X	X	X	X	X	X
14. Deliver Product	X	X	X	X		X

Research Question 3

To what extent does the rapid prototyping methodology reduce the design and development cycle time?

It was explained to the participants that cycle time in this study includes analysis, design, development and delivery of the product. Of the five people in the study, four indicated that they believe that using the rapid prototyping methodology reduces cycle time.

When asked how he felt the rapid prototyping methodology impacted cycle time, Designer #1 said " . . . it didn't add time, it added pressure and stress for me. That's what I find rapid prototyping does. It's stressful" (Transcript 001, Lines 582 - 584). However, he felt that the stress was not solely from the use of the rapid prototyping method but was due largely to circumstances within the customer organization. When describing what he felt rapid prototyping added to a project, his response was "On the other hand that's one of the things that's supposed to come out the rapid prototyping meeting . . . the look and feel that you want to experience . . ." (Transcript 001, Lines 580 - 582). He went on to say that "under the circumstances of creating traditional courses with traditional content, rapid prototyping forced an interruption in the usual design/development process" (Log 001, Lines 118 - 119). The deliverables for Designer #1's project was a one-day instructor-led course presenting an overview of the customer's products and services, and he spent 74 working days on the project. An instructor's guide with PowerPoint slides was provided to the customer. When asked in the follow-up interview how he would compare using the rapid prototyping methodology with a traditional model, Designer #1 said:

> I keep going back to the . . . time that seemed to get lost after the rapid prototyping meeting when we spent so many sessions trying to agree on a look and feel for the instructor's guide. You know that seemed to go on for three or four

> weeks. You know just trying to get everybody to agree on it. Now, I was spending a considerable amount of time redesigning and redoing that document. . . . and I'm wondering I don't know if one of the problems – well, I don't know. What would have happened is I still would have had to deal with that issue but I wouldn't also have been trying to do the other pieces had I waited until the dry run because the content would have been a lot more solid by then. The reference guide stuff probably would have been a lot more solid by then too. . . . and then . . . I really felt like I was off track just trying to work on this format issue. And I knew I was not spending the time developing the content and the materials. It was like I couldn't be focused on both at the same time. So it that was one of the things that came out of the rapid prototyping meeting. . . . (Transcript 001, Lines 566 - 580)

According to Designer #2 they "were able to produce a high quality product very quickly" (Log 002, Line 133). She attributes this to having good, solid content that did not require a lot of word smithing. She recommends getting as much information up front as possible: "Get as much from the client as I can...get that content frozen. They'll get a faster better product in the end" (Transcript 002, Lines 198 - 200). When asked to compare the process of designing with a traditional model to the Emdicium rapid prototyping methodology, Designer #2 said:

> . . . We didn't need as many reviews. With the design concept memo we were able to put the prototype together, attach that to the design concept memo and do just one review in what might have taken two or three reviews. . . . in the past what we would have is we would have done a review for the design document, taken it away, possibly had to revise the design document and review that again. Then go

> away and develop the product and then review that and then go back and make all of the revisions to it. Review it again and possibly make even more revisions. . . (Transcript 002, Lines 414 - 420)

Designer #2 spent 78 working days – almost four months -- on her project. The final products were an on-line tutorial, an on-line job aid, a participant's guide and an instructor-led class including an instructor's guide. Designer #2's customer also agrees that rapid prototyping reduces cycle time. He admitted that he did not have experience with other methods of instructional design but, when asked if he felt that the rapid prototyping process helped to get the project done quicker, he said yes. In his own words, he said:

> Now as far as if that . . . makes it quicker or not my guess would be yes. Once again I'll go back to say that I don't have experience with other methods but I would certainly think (pause) it seems to me like it would be a quicker way of doing it. (Transcript 002A, Lines 81 - 84)

Designer #3 also indicated that rapid prototyping reduced cycle time for her project. She believes the cycle time overall was reduced because

> . . . the design and development process was well thought out and enforced. The prototype was identified as a deliverable, that, once approved, launched other development activities...The Project #3 prototype was a fully-functioning, high-level version of the final course that was formally presented to the client as a prototype. (Log 003, Lines 184 - 191)

Her deliverable was a hypermedia that included individual topics made up of modules. The modules were linked to a main organizer module. Although the entire

project lasted for 24 months and included an instructor-led overview class, Designer #3 completed her hypermedia module in 41 days – just over two months. According to Designer #3, "Project #3 is a good example of things gone right because the prototype was actually defined and treated as a deliverable" (Log 003, Lines 101 - 102). Additionally, she indicated that

> . . . the subject matter expert's well-organized source material and his clear vision of what he wanted in the module were as responsible for the efficiencies as was the prototyping process. (Appendix H, Lines 540 - 543)

When asked to compare the process of designing with a traditional model to the Emdicium rapid prototyping methodology, Designer #3 indicated that:

> . . . In terms of preparing draft manuscripts and storyboards, the process takes the same amount of time, or more time if programming of the prototype is involved. But there are time savings elsewhere, including
>
> - fewer client reviews
> - fewer drafts
> - less time preparing for the pilot (the programming is already done) and fewer re-do's, because the client gets to see the 'real thing' early on. The client doesn't have to use his or her imagination to guess what the final product will look like or how it will work. (Appendix H, Lines 515 - 525)

Designer #3's customer also agreed that rapid prototyping reduces cycle time. Although Customer #2 had a specific type of prototype in mind, he indicated that the prototype should convey information that proves a process and, if it does, it should then

reduce the cycle. He agreed in general that the hypermedia prototype did reduce cycle time.

Research Question 4

To what extent does the rapid prototyping methodology enhance the quality of the instructional product?

In this study, enhancing the quality of the product is concerned with the issue of product usability to the customer and end-users. Enhanced quality in this study means that the product has withheld long-term usage (one year or more) for the customer organization and that few if any revisions were made to the product within a period of 12 months after it was delivered to the customer. Both customers indicated that their products were immediately usable to the end-users and the designers agreed with them. Additionally, the products were not revised within 12 months after delivery.

The instructor-led class and the materials that were produced by Designer #1 were used "throughout the organization on a monthly basis" (Appendix H, Lines 204 – 205), and the class was still being conducted in January 1998. Minor modifications were made to the deliverables based on feedback from the pilot. The instructional materials were piloted in a two-hour segment of the class that was conducted by the intended instructor. Subject matter experts, part of the instructional staff, representatives from the organization's product groups and potential users attended the two-hour segment. Revisions to content, activities and types of guides needed were recommended and made. The product was then delivered to the customer, who began using it immediately, "as is" (Appendix H, Line 225). The customer made modifications to the materials in April 1998.

At the time of the interview, the customer from Project #2 indicated that the class

was still being conducted and that the on-line help was still being used. Designer #2 indicated that her deliverables "stayed for almost three years. In fact, the class was never over three years and under, I think three or four different versions of the software, it was never rewritten..." (Transcript 002, Lines 404 - 405). The on-line help and the user's guide were recently updated and moved to Doc-To-Help in the fall of 1997 by Designer #2 and turned over to the customer organization for formatting, maintenance and implementation. The customer on Project #2 agreed rapid prototyping helps to produce a product that is immediately usable to the end user (See Transcript 002A, Lines 100 - 103). He also confirmed that when given what was considered the finished product he was actually able to go on line and use the help, use the tutorial and begin to conduct the actual classes (See Transcript 002A, Lines 105 - 110).

The hypermedia for Designer #3 was also immediately usable to the end-users without revisions after delivery. When asked if the hypermedia was immediately usable, Designer #3's customer said, "Now, we're talking about the hypermedia, but I think that . . . if it is if it does, in fact, prove the process was carried out properly, then it is immediately usable" (Transcript 003A, Lines 165- 169). The overview class that was part of the deliverables for this project, and developed by another designer, was conducted three times a month. The last class was held in December 1996 "and the hypermedia was discontinued in early 97" (Appendix H, Lines 617 - 619).

Research Question 5

To what extent and how does the rapid prototyping methodology impact customer satisfaction?

Both customers of the study agreed that rapid prototyping had an impact on

customer satisfaction. They both indicated that they were indeed satisfied with the product deliverables.

When asked to compare rapid prototyping with an instructional design project that did not use rapid prototyping, Customer #1 said, " ... you know the prototyping was definitely the better way to go" (Transcript 002A, Line 131). He also indicated that "the things I got from Emdicium -- they were definitely high quality you know. And I would think that this process was a big part of that" (Transcript 002A, Lines 47 - 48). Customer #1 agreed that rapid prototyping increases customer satisfaction because the product is produced more quickly and within financial and time constraints. Emdicium kept within the time constraints. Although Customer #1 did not manage the budget, he said that he believed that the project was finished within the budget.

Customer #2 also agreed that rapid prototyping increased customer satisfaction. He went on to say that "... if the product was attractive to the customer, then it would increase customer satisfaction because it, the product, would arrive earlier" (Transcript 003A, Lines 68 - 69). In regards to the hypermedia, he said, " . . . as I became more familiar with it, it became satisfactory to me" (Transcript 003A, Lines 76 - 77). Customer #2 indicated that the product was not delivered on time neither was it within budget; however, this was due to many other obstacles and not the rapid prototyping process. As he put it:

> For example, ... the systems people we had, envisioned that we had purchased two servers to distribute the hypermedia to the various systems organizations so that they could distribute it to the users. OK ... the systems people were not entirely cooperative. In other words, they said that they had other priorities. And some

> people in some cases -- they absolutely refused to ... take any action that would support the program. (Transcript 003A, Lines 176 - 181)

The designers felt that their customers were satisfied with their deliverables. Designer #1 said:

> Yeah, I think in the end . . .they were pleased with what we came up with. I know the reference guide was very well received throughout the company, and that was not an intended product. (Transcript 001, Lines 457 – 459)

Designer #2 indicated that her customer responded positively to the deliverables. In her own words, she said:

> I think it was pretty positive...I believe my memory's right that everyone, you know, was cool with it. (Transcript 002, Lines 183 - 185)

Research Question 6

To what extent and how does the rapid prototyping methodology impact designer satisfaction?

Although Designer #1 was not fully satisfied with the rapid prototyping process, Designer #2 and Designer #3 were fully satisfied with it.

Designer #1 said that he did not feel that rapid prototyping was beneficial, under the circumstances in producing deliverables for an instructor-led course. He said he didn't "know that the rapid prototyping gained us anything in this case. Except for, I mean, at first an early review of some of the materials" (Transcript 001, Lines 305 - 306). Despite these feelings about using rapid prototyping, Designer #1 says the main advantage to it for his project was "that it surfaced a concern by the intended instructor and that it [the instructor's guide] lacked sufficient detail for her (a non-expert) to conduct the training"

(Appendix H, Lines 278 - 280). According to Designer #1, it is advantageous to do rapid prototyping when doing a

> . . . CBT-type product where there is a tremendous amount of expense . . . in creating the actual materials that you don't want . . . you want to make sure that you're doing the right thing . . . because you want to make sure that everybody does have agreement on how that's going to look and feel so you can go forward and continue using that format. (Transcript 001, Lines 296 - 301)

Designer #2 indicated that rapid prototyping "...puts something in front of the client up front really early and helps them see what their final project product is going to look like. So it can be real useful to a project" (Transcript 002, Lines 190 - 192). She said since using rapid prototyping, she tries to get most, if not all, all of the content early, get the content frozen and show something to the customer.

Designer #3 felt that her project was the best of rapid prototyping because the prototype was fully structured, the content for her module was frozen, and her customer was prepared. When asked about her feelings (level of satisfaction) with rapid prototyping, she admitted she was having some problems defining rapid prototyping but said, "I love it!" (Transcript 003, Line 342).

Research Question 7

To what extent is the target rapid prototyping model a usable model?

The findings of this research suggest the Emdicium rapid prototyping model is a usable model. "Usable" in this study means that the model mirrors the real-world behavior of the designers because the components of the model reflect what the designers actually do. It also means that the outputs of using this model are:

- more customer involvement up front with a workable model;
- reduced cycle time;
- deliverables that do not have to be revised within a year after delivery to the customer; and
- a satisfied customer.

According to the research conducted, the model illustrates the milestones that the designers work toward. Their brochure details the tasks to be completed to reach each milestone. Most of the designers do all fourteen of the tasks that are indicated in the rapid prototyping model. Additionally, they perform most of these tasks proactively with the customer. Both the designers and their customers feel that rapid prototyping reduces cycle time and produces a deliverable that is immediately usable. They also said that the rapid prototype process contributes to customer satisfaction.

Chapter 5

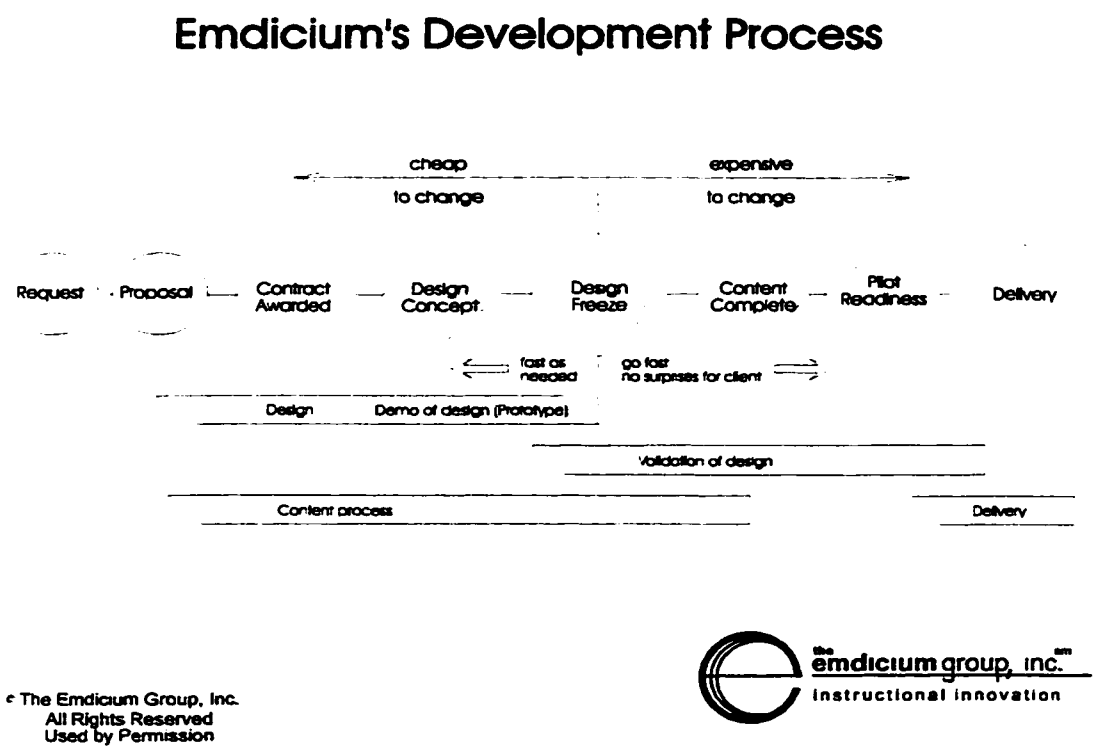
Discussion

The purpose of this study was to validate the use of the Emdicium rapid prototyping methodology, using qualitative methods in an effort to answer the following questions:

1. What does the instructional designer/developer do when using the rapid prototyping methodology?
2. What does the customer do when using the rapid prototyping methodology?
3. To what extent does the rapid prototyping methodology reduce the design-and development-cycle time?
4. To what extent does the rapid prototyping methodology enhance the quality of the instructional product?
5. To what extent and how does the rapid prototyping methodology impact customer satisfaction?
6. To what extent and how does the rapid prototyping methodology impact designer satisfaction?
7. To what extent is the target rapid prototyping model a usable model?

To validate means to show worth or value. In this study the purpose of the validation was to show the worth or value of The Emdicium Group, Inc., rapid prototyping methodology, as illustrated in their model shown in Figure 6 and based on the tasks detailed in their company brochure.

Figure 6. The Emdicium Group, Inc., Instructional Systems Design/Rapid Prototyping Model



Validation of the Emdicium methodology is based on the following criteria:

- Performance of the instructional designers
  - Do the designers do what the model prescribes? Do they do it concurrently as prescribed?
  - Does the prototype(s) facilitate the designer's quest with the customer for a final product that represents what the customer wants while producing an instructionally sound design?
  - Is cycle time reduced?
- Level of customer satisfaction with the final product
  - Is customer involvement a significant contributor to the design of the final product?

- ♦ Is the customer satisfied with the final product?

- Quality of the final product
  - ♦ Can the target users actually use the final product?
  - ♦ Does the final design represent a collaboration of efforts between the designer and the customer?

The following pages will discuss how the Emdicium rapid prototyping methodology meets the criteria listed above.

Model Validation in Terms of Designer Performance

Use of the model and accompanying Emdicium literature indicates that Emdicium's rapid prototyping methodology has the following phases – analysis, design and development. During the phases, the designers performed most of the tasks prescribed in the Emdicium rapid prototyping methodology, and they performed a considerable number of tasks concurrently. When a designer did not perform a task, either an Emdicium principal or project leader completed it. Consequently, designer performance tends to provide evidence of the model's validity.

Concurrent Designer Activity. Goodrum, Dorsey & Schwen (1993) have indicated that with rapid prototyping analysis, design and evaluative activities are intertwined. Each of these activities is part of the process followed to get to the final product. Emdicium has intertwined analysis, design and development in their rapid prototyping process and expects the designers to perform concurrent tasks throughout these three phases. This study shows that the most of the designers do concurrent processing during the analysis, design and development phases. See Table 16 for details.

Table 16
The Number of Emdicium Designers Performing Concurrent Tasks in the Analysis, Design and Development Phases

Emdicium Rapid Prototyping Tasks	Number of Designers Performing Concurrent Tasks
1. Identify audience	2
2. Identify instructional need	2
3. Identify content, tasks and processes	2
4. Identify instructional strategy	2
5. Write design memo and get approval	2
6. Write high-level outline	2
7. Identify prototype content	2
8. Build prototype	2
9. Review prototype	1
10. Freeze content	2
11. Write remaining components	2
12. Conduct pilot	0
13. Revise the product	0
14. Deliver the product	0

Three designers participated in this study, and at least two of them did concurrent processing while performing ten of the fourteen tasks prescribed in the Emdicium model. Tasks 12 - 14 do not appear to support concurrent processing. This level of concurrent processing suggests that the Emdicium model does mirror real-world instructional designer activity for most of the instructional designers when using the rapid prototyping

methodology. With traditional models, most designers tend to deviate from the prescribed procedures more frequently than was found with the Emdicium rapid prototyping methodology.

Customer/Designer Collaboration. In doing the prescribed tasks, the designers collaborated with the customers to create an instructional product that was appropriate for their needs. The collaboration is facilitated by the introduction of a prototype that gives the customer a tangible and visual product to interact with and react to. The purpose of the interaction with the prototype is to predict if it leads to a satisfying finished product. The desired end result of the collaboration is that the designer and customer together have produced a product that effects change in performance.

Rathbun, Saito and Goodrum (1997) have indicated that the prototype becomes an investigative/cognitive tool used to develop the final product. This was clearly reflected in this research. With the Emdicium rapid prototyping methodology, the prototype requires that the customer and the design team "think through" the entire instructional design process in an effort to know what the final product will be. In "thinking through," they not only must reflect back on the objectives of the product they are creating, but also interact with and evaluate the prototype and stay focused on the needs of the end user. As the customer and design team "think through" the prototype, they come to know whether or not it will progress to the desired final product that impacts performance. Each version of the prototype reflects their thinking processes and supports their vision of the final product. Additionally, by using the prototype as an investigative tool they know what works, what does not work and if the needed revisions can be implemented cost effectively and efficiently. In one of the projects in this research, evaluation of the

prototype revealed that the products needed more detail, particularly detail in the form of a reference guide. It also identified the need for revisions to the instructor's and learner's guides. The final product reflected the revisions. The designer's quest with the customer for a final product that represents what the customer wants while producing an instructionally sound design is facilitated by the prototype.

Cycle Time Reduction. One of the advantages cited in the literature about rapid prototyping is reduced cycle time. Cycle time in this research is defined as the time required to do analysis/planning, design, development and delivery of a product to the customer. In two of the three target projects, the designers felt that rapid prototyping cycle time was reduced based on their comparison of cycle time when creating a similar product using a traditional model.

In addition to the type of methodology being used, the length of cycle time is also dependent upon the following factors:

- availability of subject matter experts;
- content considerations; (Is the content technical or poorly defined? Is the content stable?)
- ability of the designer; (Is the designer the subject matter expert with knowledge of the tasks to be documented? Is the designer familiar with the technology and methodology being used to develop the product?)
- type of product being developed; (Is the product instructor-led training, hypermedia, on-line tutorial, job aid, video or a linear presentation?)

An examination of cycle time for projects using non-rapid prototyping models is beneficial in order to address this issue. Table 17 describes non-rapid prototyping project

cycle time as indicated in Zemke's 1997 article titled "How Long Does It Take?" that was printed in Training magazine. Each contributor to this article stated that factors such as subject matter expert availability, content and designer ability all influence cycle time. The data from these organizations are being used as a guideline for comparing design cycle time under traditional and rapid prototyping conditions. The data in the Zemke (1997) article was presented in hours spent in cycle time; however, for purposes of this discussion, the hours were converted to days with eight hours representing one day.

Table 17
Non-Rapid Prototyping Project Cycle Time

Instructor-Led Training	10 to 30 hours for 1 hour of instruction or 1 to 8 days for 1 hour of instruction
CBT/Multimedia Training	200 to 500 hours for 1 hour of contact or 25 to 63 days
Tutorial	300 to 400 hours for 100 series of related branches for each hour of contact time or 38 to 50 days for 100 series of related branches for each hour of contact time

Two of the Emdicium instructional designers produced a combination of products for their projects – instructor-led training and a linear-electronic PowerPoint presentation, and instructor-led training and an on-line tutorial. The third project of this study produced one module of a hypermedia. Because data regarding cycle time for a hypermedia was not available, cycle time for multimedia-based training will be used instead to determine the impact on cycle time when producing this type of product. Table 18 shows the number of

days each Emdicium designer spent producing a product while using the rapid prototyping as compared to a similar product produced with non-rapid prototyping methodology. The similar product produced with a non-rapid prototyping methodology was taken from the Zemke (1997) article. Although the time spent producing a product was presented in hours in the Zemke (1997) article, Table 18 shows the number of days because the hours were converted to days.

Table 18
Emdicium Project Cycle Time versus Cycle Time for Non-Rapid Prototyping Projects

Project #1	Non-Rapid Prototyping Project
Instructor-Led Training & PowerPoint Presentation – 74 days	Instructor-Led Training– 48 days No data available for PowerPoint Presentation
Project #2	**Non-Rapid Prototyping Project**
Instructor-Led Training & On-Line Tutorial – 79 days	Instructor-Led Training – 48 days Tutorial – 38–50 days Total cycle time 76–98 days
Project #3	**Non-Rapid Prototyping Project**
Hypermedia/EPSS module – 41 days	CBT/Multimedia Training -- 25–63 days

After a closer look at the Emdicium projects and the non-rapid prototyping projects, and considering subject matter expert availability, content, designer ability and product type, it appears that there was not a significant reduction in cycle time from using the Emdicium rapid prototyping methodology. It took 79 days to produce a one-day instructor-led training session and an on-line tutorial versus 98 days for a similar product

being produced in the comparison project. Comparatively speaking, this reflects a possible reduction in cycle time of 19 days. To produce one hypermedia/EPSS module it took the Emdicium designer 41 days versus the minimum 25 days to develop CBT/multimedia training in the Zemke (1997) article. Because the products do not reflect a one-on-one match, consideration must be given to the differences. The hypermedia/EPSS module included original graphics, branching and hypertext, explanatory text about the business process, a glossary of terms, practice and feedback. With the CBT/Multimedia, "the learners are expected to analyze, break down, troubleshoot, assess, rate, evaluate and generally employ higher-order cognitive skills; program requires scenario or case-based instruction and opportunities to practice; art required is original illustrations and/or simulations . . ." (Zemke, 1997, p. 77). The difference in cycle time is 16 days, which does not appear to reflect an actual reduction in cycle time. Instead the design and development time appears to be comparable.

It took 74 days to produce a one-day instructor-led training session that included a PowerPoint presentation. The comparison project using traditional methods took 48 days to produce a one-day instructor-led training session without a PowerPoint presentation. Although there is no comparative data from the literature regarding the development of a PowerPoint presentation, from this researcher's experience it typically does not take a significant amount of additional time to produce such presentations. All things considered, the difference of 26 days may reflect an increase in cycle time in this instance.

Emdicium claims that its rapid prototyping process reduces time in the development phase and adds time to the analysis and design phase in an effort to reduce overall cycle time (The Emdicium Group, Inc., 1993). With the Emdicium rapid

prototyping methodology, product improvements are identified during these two phases. Identifying improvements during the analysis-and-design phase is to allow the designers to spend the rest of their time developing the final product assured that it meets customer expectations. Table 19 shows the amount of time devoted to the analysis, design and development phase in the projects studied here.

Table 19
Individual Designer Time in Emdicium Rapid Prototyping Phases

Designer #1 – ILT with PowerPoint Presentation	Designer #2 – ILT with On-Line Tutorial	Designer #3 - Hypermedia
• Analysis –15 days (20%) • Design –51 days (69%) • Development –7 days (9%)	• Analysis –26 days (33%) • Design – 4 days (18%) • Development –38.25 days (48%)	• Analysis –2.5 days (6%) • Design –12.5 days (30%) • Development – 6.0 days (63%)

Most of the Emdicium designers did spend more time engaged in analysis and design than in development; however, their efforts did not appear to result in a significant reduction in cycle time when compared to non-rapid prototyping projects. In one project, cycle time was not reduced at all. This is a significant point given the numerous assertions in the literature claiming that the rapid prototyping methodology reduces cycle time. What the Emdicium rapid prototyping methodology does do is get the prototype -- a working version of the product -- to the customer early in the project. For example, with project #2 the prototype was presented within 40 working days of a 78.25-day project and within 15 working days of a 41-day project.

Model Validation in Terms of Customer Satisfaction

Tripp & Bichelmeyer (1990), Gray & Black (1994), Wasserman & Shewmake (1990) and Murawski (1990) all indicate that rapid prototyping allows the user to interface with the instructional product, identify problems and make recommendations for improvement. This study supports this claim also. The customers were all significantly involved in the analysis and design phases of the Emdicium rapid prototyping methodology. Such customer involvement presumably consisted of feedback to the designers, which not only improved the final product but also, as in one case, identified the need for an instructional product that had not been considered before. The feedback was obtained through the use of group reviews and field testing.

Customer satisfaction is a major issue for external consultants, whether or not they are external to the organization or external to the department. Increased customer satisfaction brought about by customer involvement is an advantage of the rapid prototyping methodology. This study shows that throughout the rapid prototyping process, the customer and design teams are in continuous communication and that these communications result in the customer's satisfaction with the product. This study suggests that rapid prototyping brings about customer satisfaction as a result of customer involvement.

Model Validation in Terms of Product Quality

Product quality is typically based on whether people learn from the product that was created. Witt and Wager (1994) maintain that model validation includes determining whether the participants' job performance was improved. In this study, data regarding learning performance was not available. Consequently, the view of product quality was

functional in terms of a consulting firm. "Product quality" in this study was based on the usability of the product. If the product withstood usage of at least 12 months with few revisions after delivery to the customer, it was considered usable and the product quality was considered enhanced by the rapid prototyping process. The target model seems to be valid based on this narrow definition of product quality.

The target projects in this study were selected because the final products varied – instructor-led training (ILT) with PowerPoint presentation, ILT and on-line tutorial and hypermedia. The product for Project #1 was still in use a year after delivery. The product for Project #2 was revised after being used for two years. The revision was due to the introduction of a new version of the software that the instructional materials supported. Project #3 was used for approximately four years before a redesign began. The target users were able to use the final product produced using the Emdicium rapid prototyping methodology.

The customer's interpretation of product quality is significant in any project. The final design of the Emdicium products represents a collaborative effort of the designer and the customer. All of the Emdicium customers were satisfied with the product and the rapid prototyping process. The Emdicium rapid prototyping process positively affects the quality of the final product.

Model Enhancements

This research seems to demonstrate that the Emdicium rapid prototyping model is a valid model based upon the criteria of:

- performance of the instructional designer;

- level of customer satisfaction with the final product; and
- quality of the final product.

A secondary goal of this study, and a typical conclusion of Type 2 developmental research is to present a new or improved model. It appears that including more detail can enhance the use of the Emdicium model. A more descriptive model may support instructional designers and developers working in a variety of settings when using the rapid prototyping methodology.

Figure 7 shows a revised rapid prototyping model for instructional design based upon the results of this study. This model shows tasks, cycle time, concurrent processing and evaluation, as well as continuous feedback and design team responsibility. It is comprehensive.

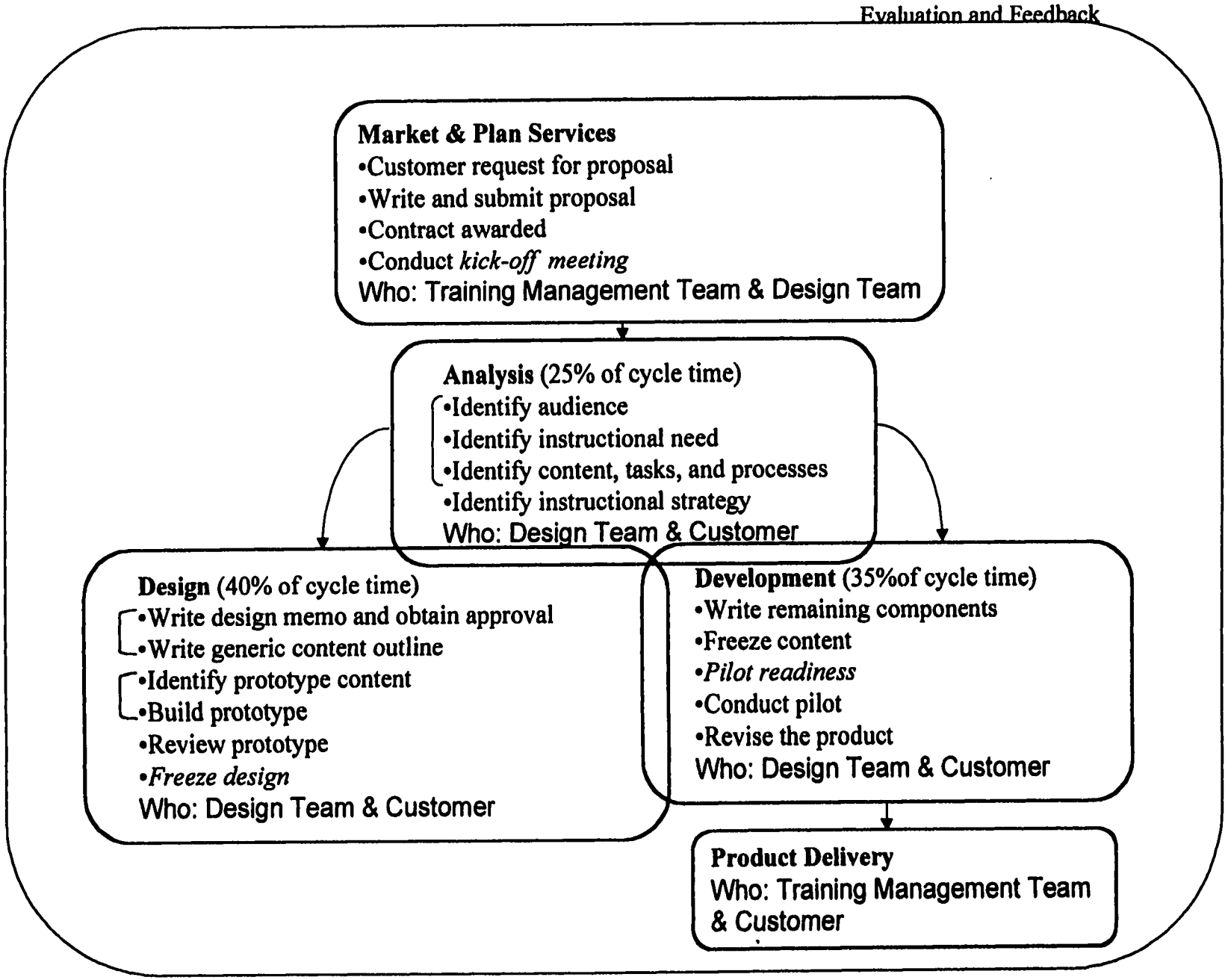
This model reflects the findings of this research and includes the participants involved in each phase, the percentage of cycle time, the milestones and the tasks. This model is appropriate for all types of instructional design projects, including paper-based and computer-based products. In the model, concurrent processing of tasks within a phase is identified in the model by brackets. Concurrent processing across phases is represented by the overlapping rounded-rectangles that represent each phase. Although concurrent processing exists, there is a sequence in which the tasks are performed as represented by the arrows that feed into the each phase; for example, the market and plan phase is followed by the analysis phase which provides input to the design and development phases. The output from the design and development phases is input to the product that is delivered to the customer. Throughout every phase in the model, some type of evaluation occurs because the customer and design team are working together to complete the tasks.

The model begins with the market and plan phase, which is a phase that exists for most instructional design projects. Whether or not the design team is internal or external to the organization or department, every project typically starts with a request for work, the awarding or assigning of that work and an initial meeting to identify roles, responsibilities, project goals, project tasks and duration.

Following the market and plan services phase is the analysis phase in which the designer spends approximately 25 percent of cycle time to identify the audience, instructional need, content, tasks, processes and instructional strategy. All of the phases overlap because the analysis task of "identifying content, tasks and processes" is also being done concurrently with the prototyping tasks in the design phase and with the "write remaining components" task in the development phases. The design phase consists of writing the design memo and obtaining approval from the client. It continues with writing a generic outline, identifying the content for the prototype, building and reviewing the prototype, and freezing the design. Approximately 40 percent of cycle time is spent in the design phase. The development phase consists of writing the remaining components of the product, freezing the content, getting ready for and conducting the pilot and revising the product. About 35 percent of cycle time is spent in the development phase. Following the development phase, the product is actually delivered to the customer.

Although the revised model may be used in a variety of settings other than a consulting firm, a possible disadvantage of the revised model is that it may not be appropriate as a marketing tool or communication vehicle for individuals without design expertise. For example, it does not show how revisions to the product affect project costs.

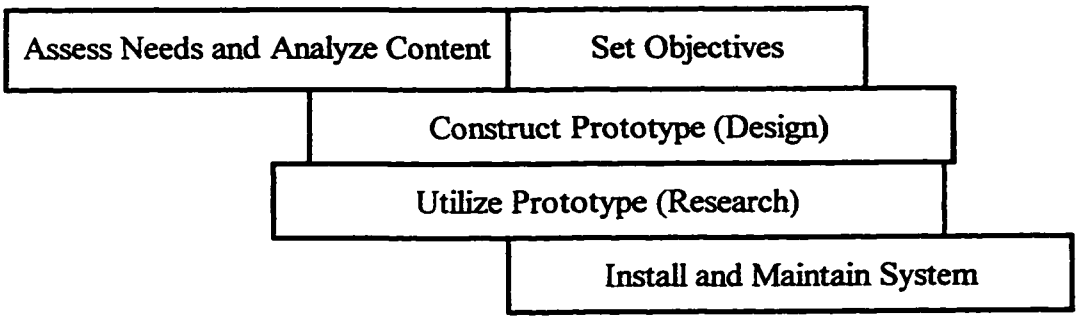
Figure 7. A Revised Rapid Prototyping Model for Instructional Design



Additionally, while the level of detail in the revised model is appropriate for instructional designers, such detail may not be appropriate for a potential customer.

Few rapid prototyping models show when the customer is involved, the specific designer tasks, or the amount of time spent in a phase. For example, the Tripp & Bichelmeyer model, shown in Figure 8, focuses on the prototype as the tool that supports design and research. It also shows the need for analysis and parallel processing.

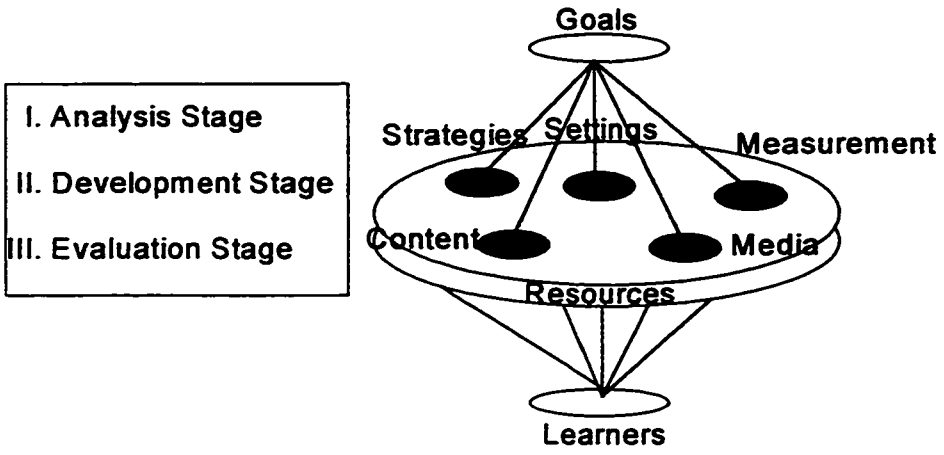
Figure 8. Trip & Bichelmeyer's Rapid Prototyping ISD Model.



Note: From "Rapid Prototyping: An Alternative Instructional Design Strategy," by Tripp, S. D. & Bichelmeyer, B. (1990). Educational Technology Research & Development, 38, p. 36.

The Yang model, shown in Figure 9, identifies three stages in its rapid prototyping model along with instructional design concepts. In the Yang model, however, it is difficult to determine the composition of and the tasks performed in the three stages – analysis, development and evaluation. To see that information, you must examine each of the component models associated with the various stages. Each of these sub-models show the instructional design tasks associated with that stage.

Figure 9. Yang's Instructional Design Model



Note: From "Managing Courseware Production: An Instructional Design Model with a Software Engineering Approach," by Yang, C., Moore, D. M., Burton, J. K. (1995). Educational Technology Research & Development, 43, p. 62.

The Emdicium model, shown in Figure 6 on page 93, does show pre-project activity, design of the prototype and content gathering. It also highlights the benefits of making changes early in the project and the consequences of making changes late in the process. However, it does not clearly emphasize the different phases in the instructional design process, specific designer tasks, nor time typically spent during the phases. Such detail is reflected in the revised model.

Further Research Needs

While this study did provide a beginning to rapid prototyping research, there is a great deal of additional research required. The field could especially benefit from the findings of a controlled experimental design that systematically compares the impact of the use of a traditional instructional systems design model and a rapid prototyping design model. Such research may clearly show differences in cycle time that were not easily determined here. Further research may also identify why one designer may prefer the rapid

prototyping methodology while another may not. It may also determine whether designers' reactions to using the rapid prototyping methodology are influenced by their background experiences or whether model preference is arbitrary.

In addition, research is needed that determines whether the end-users' on-the-job performance is improved after training with a product designed in a rapid prototyping fashion. This line of study would expand the more narrow definition of product quality used in this study.

Summary

The model addressed in this study is a usable model. Most of the designers performed all of the prescribed tasks, are satisfied with the rapid prototyping process and are also satisfied with the resulting product. The customers are also satisfied with the products resulting from the use of the Emdicium model.

This research demonstrates how instructional designers produce different types of instructional products with the rapid prototyping methodology. It also demonstrates how the instructional designer's collaborative effort with the customer results in an enhanced level of satisfaction. Customer involvement through using and experiencing the prototype is a major aspect of rapid prototyping. The rapid prototyping methodology enables the customer to evaluate the content as well as the user interface of the product. The early and continuous feedback from customers, supports them in the "thinking through" process that is encouraged by the rapid prototyping methodology. It also demonstrates that customer satisfaction and product quality are enhanced as a result of the rapid prototyping methodology. It also raises questions as to whether the most important benefits of rapid prototyping relate to cycle time reduction. Certain events appear to occur earlier with

rapid prototyping than with a traditional model, but overall product completion is not significantly reduced; that is, the rapid prototyping methodology in this study had a minimal impact on cycle time reduction. Even so, this study seems to point to a "win-win" environment for the customer and the design team when rapid prototyping methods are adopted.

Appendices

Appendix A – Resumes

Instructional Designer # 1- Senior Designer

Education

Ph.D. Candidate, Instructional Technology, Wayne State University (expected matriculation: 6-98)

M.L.I.R. (Masters, Labor and Industrial Relations) Michigan State University

MA, Industrial Psychology, Western Michigan Univ.

BA, Psychology and English, University of Michigan

Experience

The Emdicium Group, Inc., Bingham Farms, MI

1995 – Present

As a senior designer, Instructional Designer #1 is responsible for analysis, design, development, and evaluation of various projects.

Instructional Designer #1 designed and implemented an efficient, cost-effective training needs assessment approach for Chrysler Corporation. Combining survey methods and focus groups, he completed an analysis for the Pre-Program Engineering Tech Club that included researching sources, in six weeks. He was requested to present the approach to the Executive Training Committee so that other Chrysler Tech Clubs might take advantage of it.

For Healthcare Systems, Instructional Designer #1 is responsible for the analysis, design, and development of industry orientation and product awareness courses. He is also creating a style guide for blueprinting future course development. Initially viewed as redesigning an existing course, following analysis, it was determined that an entire new course with additional information, extensive graphics, and learner-centered activities was needed. This work has entailed arranging and conducting analysis meetings, developing activities and materials, conducting pilots, and maintaining close contact with the client. The output of this effort will be courses that Healthcare Systems will use internally with all new employees and externally with their clients.

Instructional Designer #1 assisted with the development of a user guide for Ford Motor Company, Inc. This involved creating text and graphic representations for various technical processes relating to Ford's Materials and Toxicology Systems.

1993 – 1995

Michigan Electric Power Coordination Center, Ann Arbor, MI

As the Training Analyst-Coordinator, Instructional Designer #1 managed the training needs for this 60-person combined utility facility. Highly technically oriented, the job entailed conducting front-end analyses to define performance gaps, in-depth consultations with involved parties, and recommendations to management for problem resolution. When training was the appropriate intervention, Instructional Designer #1 performed task analysis, designed and developed training materials and programs, implemented, and evaluated the course.

In the capacity of Training Coordinator, Instructional Designer #1 established training matrices for each position, identifying by skill and knowledge the most feasible sources for training. He then arranged training for individual employees, tracked successful completion, operated within budget, and provided periodic reports to management regarding the status of training.

Instructional Designer #1 served as project manager on several internal and external projects. He was responsible for assuring the timely completion of an on-line electric reservation system used by power suppliers throughout the mid-west. An internal projects that he coordinated involved switchover for the Power Control group to a new power grid system.

1989 – 1993

Midland Training Center (Consumers Power Company), Midland, MI

As Instructional Technologist Supervisor, Instructional Designer #1 was in charge of the instructor-training program for Consumers Power Co. In this capacity, he: supervised the training activities of Instructional Technologists; established program budgets; participated in strategic planning for nuclear training; created and implemented training courses; and, helped maintain accreditation of the instructor training program by the Nuclear Regulatory Commission.

Instructional Designer #1 designed, developed, and implemented train-the-trainer programs on: the design and development of tests; developing instructional objectives; and, enhanced learning techniques. These courses became required training for all nuclear training instructors within the company.

As part of the nuclear training group, Instructional Designer #1 participated in Institute of Nuclear Power Operations evaluations both internally and as an external evaluator at nuclear plants belonging to other companies. This involved level 3 and level 4 evaluation activities.

1985 – 1989 **Saginaw Service Center (Consumers Power Company), Saginaw, MI**

As a Human Resources Administrator, Instructional Designer #1 engaged in problem definition and resolution activities. He was instrumental in negotiating the first contract for a regional Employee Assistance Program. He, also, established a model for a company-wide career development program.

Instructional Designer #1 supervised three clerical workers and redesigned their work processes. This enabled flextime scheduling resulted in more timely report generation, and absenteeism was significantly reduced. The scheduling system employed was successfully incorporated into other departments.

1983 – 1985 **Michigan Rehabilitation Services (State of Michigan), Saginaw, MI**

In the capacity of rehabilitation counselor, Instructional Designer #1 worked with physically, mentally, and emotionally challenged adults to assist them in becoming employable. This involved in-depth assessment of their potential and limitations, development of career plans, arranging of financial assistance to pursue training, placement assistance, and post-placement follow up.

Instructional Designer #1 established the first joint venture between the Rehabilitation Services and McDonald's restaurant. This involved placing clients into the McDonald's training program for screening, assisting them in job adjustment, and providing ongoing coordination activities to the employer.

1981 – 1983 **Disability Determination Services (State of Michigan), Traverse City, MI**

As a disability determination examiner, Instructional Designer #1 assessed client's eligibility for Social Security benefits based on the severity of their disabling condition. This required extensive understanding of medical conditions and limitations imposed thereby, and of the specific criteria required for eligibility.

1978 – 1981	**Kalamazoo Regional Psychiatric Hospital (State of Michigan), Kalamazoo, MI** Instructional Designer #1 worked as a Resident Care Aide Trainer with the nursing staff at this in-patient hospital for the mentally and emotionally impaired. His primary responsibilities were to teach communication, management, and physical/non-physical intervention techniques. He developed several modules of the curriculum, including: human sexuality; managing groups; and, signs, symptoms, and interventions for agitation.
Professional Affiliations	American Society for Training & Development (ASTD), 1990 to present. (Chapter Newsletter Editor, 1991; Chapter President-elect, 1992; Chapter President, 1993)
	National Society for Performance Improvement (NSPI), 1992 – 1995
	Valley Society for Personnel Administrators (VSPA), 1985 – 1990
Presentations/Papers	Presentation to Midwest Nuclear Training Association, May, 1994: "Application of Enhanced Training Techniques"
	Presentation to Consumers Power Instructor Conference, August, 1994: "Enhanced Learning: The Learner Perspective"
	Presentation to Midwest Nuclear Training Association, May, 1993: "Design and Development of Tests"

Instructional Designer #2 – Senior Instructional Designer

Education

Ph.D., Instructional Technology, Wayne State University

M.A.T., Reading, Oakland University

B.A., Education, University of Michigan

Experience

The Emdicium Group, Inc.

1989 – Present

As Senior Instructional Designer Instructional Designer #2 is responsible for the design, content, and development of projects for a variety of clients.

For Ford Motor Company, Instructional Designer #2 led a team in a needs analysis for the new Global Program Letter Uniform System. Based on that analysis the team developed embedded training, on-line job aids, classroom training, and user documentation. The courses and document assist in the implementation of a new business process. As the development team implements new phases of the system, Designer #2 will design and develop interactive user documentation. Users will able to access the documentation via Ford's intranet.

For Chrysler Corporation, Instructional Designer #2, working with a team of engineers from Interior Systems, identified the skill and knowledge areas needed by engineers when performing their job. Using this information, Instructional Designer #2 identified available courses and a process for the development of a curriculum matrix.

For Bell Atlantic, Instructional Designer #2 led a team in the analysis of Small Business Consultant skills in the areas of systems performance, sales, and service. Based on the findings of the analysis, the team identified deficient areas of performance and prioritized areas of training for Small Business Consultants.

For Ford Warranty Training Group, Instructional Designer #2 led a design and development team in the design and implementation of training for a new warranty system. This curriculum, containing five courses, implements a change in the way users approach and think about warranty data. It also

provides hands-on training and practice with the

warranty system.

For Chrysler Corporation, Instructional Designer #2 designed and developed a series of courses for implementing quality in the manufacturing process. The courses included a one-day Failure Mode Effects Analysis (FMEA) workshop, a one-day Process Control workshop, and a one-day workshop on implementation of Poka-yoke (error proofing). This FMEA workshop included analysis of problems from the workplace.

For Ford training, Instructional Designer #2 assisted in the design and implementation of the training needs analysis to identify the training needed to implement the product. She conducted focus groups and analyzed data. She also assisted in the initial design and development of the hypermedia process module pilot for training.

For Chrysler Credit, Instructional Designer #2 led a team that designed and developed a performance improvement system for a new customer collection mainframe system. The performance improvement system included a job aid, a simulated application and synchronized audiotape.

For Blue Cross/Blue Shield of Michigan Instructional Designer #2 planned and collected data for a needs assessment. She interviewed training managers in different departments to assess current training and future training needs on a corporate-wide basis. She then analyzed data and presented information to decision-making managers.

For a national quality-consulting firm, Instructional Designer #2 designed and developed Meeting Skills Leader's Materials.

For Ameritech Publishing, Instructional Designer #2 implemented a three-day workshop on designing and developing training and performance aids.

For Ameritech Publishing, Instructional Designer #2 designed and developed a stand-up course for reading and interpreting new forms which learners used as part of a new computer mainframe system. She also designed and developed a stand-up course on dealing with change in the workplace. This course assisted learners in dealing with changes in their jobs and tasks

	that they were going to perform with the new system.
1986 – 1989	**Detroit Public Schools**
	As a computer instructor for K-8, Instructional Designer #2 was responsible for designing, developing and implementing a computer curriculum for 500 students.
1973 – 1986	**Detroit Public Schools**
	Instructional Designer #2 was an elementary school instructor responsible for implementing early elementary curriculum in the classroom.
Professional Affiliations	Michigan Society for Instructional Technology (MSIT)
	National Society for Performance and Instruction (NSPI)

Instructional Designer # 3 – Instructional Designer. Writer. Editor.

Areas of Specialization

Internet Documents and Libraries * Windows Help * Hypermedia * Computer-Based Training

Computer Support Documentation

Additional Capabilities

Task Analysis * Training Programs and Workshops * Meetings * Speeches * Brochures * Audio and Video Scripts * Editing

Software Packages

Microsoft Office for Windows 95 ® (Microsoft Word, PowerPoint, Excel, Access) * Doc-to-Help ® Version 2.0 * OmniPage Pro ® Version 6.0 * Corel Graphics ® 6.

Technical Resources

Pentium® Computers * Laser and Color Printing * Optical Scanning including OCR

Employment

January 1989 to present - Self-employed. Have designed and developed computer-based and print materials for the Sandy Corporation, Ross Roy, Inc. and the Emdicium Group, Inc.

January 1985 to January 1989 - Sandy Corporation, Troy, Michigan. Responsibilities included project management, development of proposals, and design and development of support and training materials for computer applications.

April 1973 to January 1985 - Creative Universal, Inc., Warren, Michigan. Responsibilities included development of proposals, and design and development of training, marketing and presentation materials.

June 1969 to April 1973 - UARCO Incorporated, Barrington, Illinois. Responsibilities included development of policy and procedure manuals, computer and forms handling equipment reference materials, and sales aids for a nationwide sales force.

Education and Professional Development

B.A.., English and Psychology, Carroll College, Waukesha, Wisconsin

Designing Instruction, Friesen-Kaye Associates, Ottawa, Ontario

Problem-Solving, Decision-Making and Planning, Business Processes Inc., Southfield, Michigan

Pilot Plus Programming, International Institute of Applied Technology, Inc., Washington, D. C.

Desktop Publishing, Henry Ford Community College, Dearborn, Michigan

Instructional Media, University of Michigan, Dearborn, Michigan

ISO 9000 Implementation, Perry Johnson, Inc., Southfield, Michigan (scheduled for

April 28-May 2, 1997)

Projects

American Motors: AMC Service Protection Plan Training

American Paper Institute: Recovery Boiler Operation and Emergency Shutdown Procedures Training

Ameritech (Michigan Bell): Centrex Brochure, Central Office Product Display Presentations, 1983 Business Expo Presentations, Premiere 2/6 Sales Product Announcement, Relocation Brochure, "Breakthrough" Presentation, Sales Incentive Presentation, Pioneer Convention Welcome Speech, Ford Managed Service Center Training

ARA Food Services: Spend to Achieve Seminar, Zero-Based Budgeting Workshop

Brunswick: Bowlervision Manager's Control Desk User Support Materials

Buick: Warranty Administration, 1981 Emissions Update Training

Caterpillar Tractor: Using Metric Measuring Tools Training

Chrysler: Customer Satisfaction Workshop, Right From the Start Customer Service Seminar, Dealer Service Clinic Guide, Dealer Information Access System (DIAL) Training, Pro-Ed Training System Videodisc and User's Guide, Operation Control Quality System (OCQS) Presentation

Cole National: Key Duplication Training

Continental Forest Industries: Water Treatment Procedures Training

CPC: Supplier Conference Parts Ordering System Demonstration, Open House Presentation, 1984 Sales Kickoff Presentation

Crown Zellerbach: Kraft and Semi-Chem Pulping Procedures Training

Detroit Edison: Consultive Selling Skills Training

Ford: Fast-Start Service Training, Service Management System Training, Service Advisor Sales Training, Extended Service Hours Training, Extended Service Contract Training, Consumer Protection Presentation, Servicing the 5-Speed Manual Transaxle Videodisc, Electronic Mail User's Guide, Consumer Protection Presentation, Speech for American Vocation Association, Overview Course, Hypermedia, Ford 2000: Working in a Multi-Cultural Organization Workshop, Ford Technical Education Program (FTEP) Training, Implementing Prototype Globalization in the SN95 Program Presentation

Ford Motor Credit: Real Estate and Industrial Financing Direct Mail Program

FTD: Console Operator's Manual

GM Service Research: Graphic Mode Diagnosis and Repair Manual, You and Your Automobile Booklet

Hart Schaffner & Marx: Multiple Selling Skills Training

IBM: DB2 Relational Database Design Training

Mictron: Diagnostic and Networking Base User's Guide

NBD: In-Branch Training Center Product Training, Auditing Department Procedures Analysis

NCR: Using the Software Development Environment Training

Parke Davis: Good Manufacturing Practices Overview Training

Pontiac: Computerized Inventory Management System Task Analysis, Eliminating the Causes of Customer Comebacks Training, Production Ordering Management and Scheduling System (POMS) Training

Sherwin-Williams: Selling Hard Surface Floor Coverings Training, Selling Wall Coverings Training, Using the Computerized Order Entry Terminal Training

UARCO: Product and Equipment Sales Training and Promotional Materials, Policy and Procedure Manuals, Equipment Reference Manuals

Union Oil of California: Minute Man Island Service Training, Air Conditioning Diagnosis and Repair Training

Union Pacific Railroad: Using the Autobill System Training

USF&G: Worker's Compensation Windows Help

Weyerhauser: Operating the Thread Tape System Training, Operating the Coated Broke Pulper Training

Appendix B – Organizational Information

Organization # 1

Organization # 1 supplies and integrates systems for the managed healthcare industry. Organization # 1 is located in Farmington Hills, Michigan and employs nearly 900 employees.

Organization # 1 provides consulting services, outsourcing services and information systems to support integrated delivery systems and managed care organizations.

Organization # 2

Organization # 2 was incorporated in 1903 in Lansing, Michigan. Organization # 2 is located in metropolitan Detroit.

Organization # 2 has manufacturing, assembly and sales operations in 31 countries on 6 continents and employs approximately 338,000 employees. Other Organization # 2 products and services include industrial engines, construction machinery, glass and plastics, financial services, insurance, automotive replacement parts, electronics and land development.

Appendix C – Designer Log Instrument

Informed Consent for Emdicium Participants

Research title:

Validating the process of designing and developing instructional materials using the rapid prototyping methodology

By:

Toni Stokes Jones

Introduction:

You have been asked to participate in a research study using qualitative methodology. There are 11 participants in the study. The purpose of the study is to validate the process of designing and developing instructional materials using the rapid prototyping methodology.

Findings developed during the course of the research will be provided to you.

Procedure:

Participation in the study involves completing a written survey and taking part in a 45-minute audiotaped follow-up interview. This procedure will be done for two projects you have completed. It should take about 45 minutes to complete each survey. After you return the survey I will contact you to schedule the follow-up interview. The purpose of the interview is to clarify your answers on the survey.

Risks:

There are no foreseeable risks or discomforts to you as a result of participating in this study.

Voluntary Participation/Withdrawal:

If you have any questions concerning your participation in this study now or in the future, Dr. Peter A. Lichtenberg, Chairman of the Behavior Investigation Committee, or one of his associates can be contacted at (313) 577- 5174.

If you have any questions regarding your rights as a research subject, Dr. Peter A. Lichtenberg, Chairman of the Behavior Investigation Committee can be contacted at (313) 577-5174.

You have the right to terminate your participation in this study at any time. There will be no consequences of termination. However, the benefit of participating is that you will be provided with the results of the study and the results may possibly assist you in future projects.

Confidentiality:

The information that you provide in the survey or during the audiotaped interview will be anonymous. When completing the survey, feel free to omit any questions. Please do not discuss your comments with anyone other than Toni Jones, the researcher.

At the conclusion of this study the audiotapes will be destroyed. None of the information that you provide will be used for performance appraisal by the principals of The Emdicium Group, Inc.

Consent to Participate in the Research Study:

I have read the above information about this research study, including the procedure, risks, side effects and the likelihood of any benefits to me. The content and meaning of this information has been explained and is understood. All my questions have been answered. I hereby consent and voluntarily offer to follow the study requirements and take part in this study. I will receive a signed copy of this consent form.

_____ _____

(Signature) (Date)

After signing this consent form, please copy it and immediately mail the original to Toni Jones in the enclosed letter-sized envelope. Keep the copy for your records.

Directions:

- Prior to receiving this survey you agreed to document the process taken to complete two projects using the Emdicium rapid prototyping model. **Complete the attached survey for one of the two projects.** When a task or duration does not apply, please put N/A in the appropriate box or leave blank.
- Please refer to the original project proposal, time sheets, design concept memo, review notes, final deliverable, or any other project related documentation to assist you in recalling the rapid prototyping process used on the project in question.
- Attached for your convenience is a list of definitions (on the last page) of the phases of the design/development cycle as set forth for purposes of this research.
- Please **return** the completed survey to Toni Stokes Jones via U.S. postal service in the attached self-addressed stamped envelope **by September 15, 1997**. I will contact you no later than September 22, 1997 to schedule an appointment for a follow-up interview.
- If you have any questions, please contact Toni at (248) 644-5160 during the day or (248) 967-2326 in the evening.

Thank you for agreeing to participate in this study.

Following is an example of the survey with responses.

Task	**Description of this task in your project. Indicate parallel processing when appropriate.**	**Duration**
Identify content for the prototype	*Using the content outlines, we decided to do the prototype of chapter one of the instructor's and participant's guide. I worked with the SME to identify the business processes, tasks and other content associated with the chapter. The prototype included one completed chapter and had outlines for the other chapters. This task was done in parallel to identify content for the entire instructor's guide.*	*7 days*
Revise the prototype	*After a 2-day review session with the customer we made the following revisions to the prototype: included icons for each new section, updated and created new exercises to be more process oriented, and reorganized the content.*	*4 days*
Deliver the product to the customer	*We finished the final product one week ahead of schedule. The final deliverable consisted of an instructor's guide, electronic slides, participants' guide and quick reference guide.*	*N/A*

Task	Description of this task in your project	Duration
Identify audience		
Identify instructional need		
Identify content, tasks, process, etc.		
Identify instructional strategies		

Task	Description of this task in your project	Duration
Write design concept memo		
Develop high-level content outline		
Identify content for the prototype		
Design and build the prototype		

Task	Description of this task in your project	Duration
Review the prototype with the customer and revise as needed		
Get agreement regarding the prototype and freeze the content		
Write the remaining instructional components including user interface, screen design, page layout, etc.		
Pilot test the product		

Task	Description of this task in your project	Duration
Revise the product		
Deliver the product to the customer including client reaction to it		

Final Note: Please write your reaction with an explanation to the following statement. (If more space is needed, please use the back of the sheet.)

Rapid prototyping appears to help produce quality instructional materials in less time than traditional instructional systems design models. It reduces cycle time since a small portion of the finished product represents a great deal of the finished product.
Agree ___ Disagree ___ Explain your response.

Definition of the Design/Development Cycle Phases

Analysis is the planning phase of the instructional design process in which the general requirements of the instructional innovation is determined. It typically identifies

- audience
- instructional need
- context
- content
- procedures
- processes
- instructional strategies

Design is the phase in which you

- write the design concept memo
- develop a high-level content outline
- identify content for the prototype
- design and build the prototype
- present the prototype to the customer for review
- revise the prototype
- get agreement regarding the prototype
- freeze the content

Development is also known as the production phase. During this phase

- each instructional component (e.g., chapter or module) is written
- the user interface is finalized
- the screen design and page layout are completed
- the product is pilot tested
- final revisions are made

Delivery occurs after the customer has approved the final version of the product. It is the point in which the final product (deliverable) is given to the customer.

Appendix D – Designer Follow-Up Interview Questionnaire

1. Did you explain the rapid prototyping process (RP) to the customer?
2. What was his or her reaction to the process?
3. Now that you have used RP, what is your feeling about it?
4. What, if any, negative feelings or regrets do you have about using RP?
5. What, if any, positive feelings do you have about using RP?
6. How complete were the revisions to the prototype?
7. How complete were the revisions to the product after the pilot?
8. How closely does the final product resemble the prototype?
9. What, if anything, would you do or have you done differently when using RP since this project? Why?

Appendix E – Customer Telephone Interview Questionnaire

Prior to receiving this phone call you agreed to complete a survey regarding a project in which you employed the services of the Emdicium Group, Inc. You were also asked to refer to the original project proposal, time sheets, design concept memo, review notes, final deliverable, or any other project related documentation to assist you in recalling the process used in the project in question.

The information that you provide in this interview will be anonymous. None of the information that you provide will be used for evaluative or sales purposes. The results of the study will be provided to you upon request.

Feel free to not answer a question during the interview or to terminate the interview at any time. However, completing the interview may assist you in future projects that use the rapid prototyping methodology.

Emdicium uses a process called the rapid prototyping process to design and develop instructional innovations. Based on your involvement in the rapid prototyping process please provide your reaction with explanation to the following statements.

1. Rapid prototyping helps produce quality instructional materials.

   Agree ___ Disagree ___ Please explain.

2. Rapid prototyping produces the final product in less time than traditional instructional development models.

   Agree ___ Disagree ___ Please explain.

3. Rapid prototyping increases customer satisfaction because the product is produced quicker and within the financial and time constraints.

   Agree ___ Disagree ___ Please explain.

4. Rapid prototyping reduces cycle time since a small portion of the finished product represents a great deal of the finished product.

   Agree ___ Disagree ___ Please explain.

5. Customer input is a major component of the rapid prototyping process. The prototype should be reviewed and revised based on the customer's feedback. This feedback minimizes revisions in the product during the pilot stage.

   Agree ___ Disagree ___ Please explain.

6. Rapid prototyping helps to produce a product that is immediately usable to the end user.

   Agree ___ Disagree ___ Please explain.

Appendix F – Designer and Customer Interview Transcripts

Transcript 001

*Instrumentation for the Telephone Interview with Emdicium Employees
*Interview Transcript for Designer #1
October 22, 1997
*Q1: OKAY, THE FIRST THING THAT I'M GOING TO DO IS GO THROUGH QUESTIONS THAT I'VE WRITTEN ON YOUR ACTUAL SURVEY FORM AND THEN I'LL PROBABLY ASK YOU SOME ADDITIONAL QUESTIONS. FIRST QUESTION IS DO YOU RECALL THE ESTIMATED PROJECT TIME THAT WAS SUBMITTED ON THE PROPOSAL?
DESIGNER #1:
We estimated 2 courses at the same time and they all rolled together and I think we rolled the both of them in 3 months.
*Q2: OKAY, CAUSE IT LOOKS LIKE YOU ACTUALLY GOT FINISHED IN 2 ½ MONTHS.
DESIGNER #1:
Well that was only one course. And one of the problems the original conception was that the guts of the course would be in place. All we were doing was fine tuning it and making some minor adjustments to it. We wound up going back to square one. Umm, this course we knew was going to be a ground up umm course with products and services. This was done second umm.
*Q3: HOW LONG DID IT TAKE YOU TO DO THE OTHER ONE
DESIGNER #1:
Umm, that one that took umm shoot I think we started the project in February and rolled it out in end of March. So time wise probably about 6-8 weeks.
*Q4: ON PAGE 3, YOU HAVE LETS SEE STARTED WITH A SINGLE KNOWLEDGE ABLE SUBJECT MATTER EXPERT THIS PROVIDED SCOPE HE LEFT COMPANY BEFORE PROJECT COMPLETION. THEN HAD TO RELY UPON SUBJECT MATTER EXPERT FOR EACH TOPIC AREA. ELEVEN IN ALL. SO YOU HAD 11 SUBJECT MATTER EXPERTS.
DESIGNER #1:
I think its important to understand that there's a few things going on here. This is a relatively new company. Most people have less than 2 years and a lot of most of them 1 year in the positions, umm; it's a growing company. It's in a very fast growth stage right now. Umm, I think they (?) their employees within the last 3 or 4 years. So a lot to turn over. Lot of new positions. And umm so finding one knowledgeable person about the range of products and services offered especially when you've 3 clearly demarcated groups and divisions wasn't going to happen.
*Q5: OKAY. DID EACH SUBJECT MATTER EXPERT KNOW THAT YOU WERE USING THE RAPID PROTOTYPING PROCESS?
DESIGNER #1:
You know what some of the subject matter experts weren't even...they came in well after the fact. The rapid prototyping part this guy was still in place for that. We did the rapid prototyping within you know within a few weeks of actually

getting going on the project. Umm, by the time, yeah, and then he left. See where I ran into difficulty what happened umm, what happened here is rapid prototyping to me doesn't fit well when you using a layers of necessity approach. Because it assumes you can collect you know most of the pertinent information up front so you can go ahead and put in your rapid prototyping. And the way this kind of thing happened is it just evolved like peeling an onion.

*Q6: SO YOU WERE NEVER REALLY AT A POINT WHERE THE CONTENT WAS FROZEN THEN? BECAUSE IT KEPT EVOLVING?

DESIGNER #1:

The day we turned it over. (Laughter)

*Q7: OKAY. AND LETS SEE IDENTIFY INSTRUCTIONAL STRATEGIES, YOU SAID THE GENERAL STRUCTURE EMERGED AND BEST MEANS FOR CONVENING WERE REVIEWED WITH SPONSOR. MEANING THE FACT THAT YOU CAME UP WITH AN INSTRUCTOR'S GUIDE, LEARNER'S GUIDE AND POWERPOINT OR WHAT EXACTLY DO YOU MEAN MY THE BEST MEANS FOR CONVENING.

DESIGNER #1:

Well, umm, I think the way this happened is we started out thinking that we were going to present the course and information in one way. And as it evolved it became apparent that one of the most useful things we could do would be to create a reference guide because it was such a wide range of products and services going on here that the employee could it take back and use it you know on a regular basis. And that then became part of the primary vehicle umm for convening information. A lot of what the course operated around was working with that document. And that wasn't really narrow that in until after the rapid prototyping ended before we identified what that was going to be. That was going to be the best vehicle we'd to use.

*Q8: DID THE PROTOTYPE HAVE ANY WELL YOU SAID IT CAME UP AFTERWARDS BUT DO YOU THINK THAT HAVING THE PROTOTYPE HELPED TO IDENTIFY THAT NEED?

DESIGNER #1:

When dealing with the prototype we really field-tested the instructor 's format, the learner's guide format and one section of the content. One small section of content to see how that would come across. And if there was making you know any kinds of distinctions we wanted.

*Q9: YOU FIELD TESTED IT WITH USERS IN A CLASS ROOM SETTING OR JUST BY LETTING THEM HAVE A REVIEW – SIT IN ON A REVIEW MEETING?

DESIGNER #1:

We field tested by having the instructor actually teach about a 2-hour segment to a range of what would be the audience. We had SMEs, we had other instructors and part of the instructional staff and we had a couple of potential users. For the most part it was the audience though in part it was instructional staff. And part of that was okay because a lot of the information was nearly done too. So they were kinda wearing two hats.

*Q10: AND THAT PARTICULAR SITUATION WAS ONE OF THE OUTCOMES OF THAT REFERENCE GUIDE?

DESIGNER #1:
I don't think that came out that session. Umm no umm the reference guide came as a guide. As a stand-alone document it evolved later. What was included in that session was a couple pages of comparisons. So and that was the beginnings of the reference guide but we realized it was no where near enough information. In fact there was just enough there to be somewhat misleading. And that's where the need maybe in a sense part of that was identified at that point because some questions were raised about what was on those comparison pages. And whether or not it was giving all three products a fair representation. We had representatives for each of those three products in that group as well. And you had you know this person say I don't think that's accurate about my product. And the reason we couldn't portray them accurately was because we weren't going to a deep enough level in umm describing the products. And that was were the decision was made to do the reference guide. You gotta be able to make subtle distinction between the products and this as we had it would not allow that.
*Q11: OKAY. THE PRODUCTS BEING THE ORGANIZATION #1 PRODUCTS.
DESIGNER #1:
The primary products of Organization #1.
*Q12: SO THAT I GUESS A REVISION THAT CAME UP AS A RESULT OF HAVING THE PROTOTYPE WAS TO MAKE MORE – TO ADD MORE DETAIL?
DESIGNER #1:
Well, the need that came out the prototype umm around that was the content concern that umm are we fairly depicting all of the products. And then that raised the issue of well is there a better way of doing this? We really were kinda trying to stay away from doing umm a detailed reference guide because it would need fully a lot of specific information and there was no single source to get it. We were sort of trying to avoid it but it wasn't avoidable. And so it did it added a lot of time. But the main thing that I would say came out of the prototype umm session and the thing that prolonged if you will umm some of the process was as I said part of it was to review the instructor's guide and the learner's guide and the format for those. And we knew that we knew that was one of the intents – it was that we were going to throw out a style and see how people responded to it. Well because in that culture consensus is a requirement umm the consensus being not only current instructors but probable future instructors. Umm it became it was a month and a half before there was agreement. Umm, and that was involving a lot of revisions and the iterations and reissues of the instructor's guide. Looking at meetings for review and wow (laughter and gesturing)
*Q13: IT WENT ON AND ON. OKAY YOU ALREADY SAID THAT THE CONTENT NEVER REALLY WAS FROZEN AND YOU SAID THAT THE CONTENT WAS ONLY 30% COMPLETE AT THAT TIME
DESIGNER #1:
I would say that was probably about right.
*Q14: I ALREADY ASKED YOU WHAT TYPES OF REVISIONS WERE MADE. OH, AFTER YOU PILOTED THE PRODUCT WERE THEIR REVISIONS – ITS ON PAGE 6 – YEAH, YOU SAID WE PILOT TESTED

THE PRODUCT, CONDUCTED WITH AUDIENCE, COMPOSED OF ETC. WITH FEEDBACK TO ENABLE REVISIONS. WHAT TYPES OF REVISIONS CAME OUT THAT PILOT?
DESIGNER #1:
after the pilot what did we do? Umm, again there were umm, there were some specific comments, recommendations, a lot of issues around content. Specific things about how certain products were represented or there were questions about the accuracy of certain things in the umm reference guide. Umm, those things were changed. The other we changed as I recall was we modified a couple of activities. Umm, as the pilot was conducted the instructor went into far too much detail umm, in working through the reference guide. Umm, and so we incorporated a couple of activities that basically let people work in small groups to work their own way through the reference guide and then come back together and pool their work so we modified activities and the strategy.
*Q15: WAS THE BASIC PAGE LAYOUT AND PACKAGING CHANGED? DID THAT REMAIN THE SAME?
DESIGNER #1:
After the pilot umm the basics didn't change. We maintained that. You know by then they had agreed and I had sort of I had drawn a line in the sand and said we can't keep doing this. It's too timely and too costly. And so they settled on an umm approach.
*Q16: OKAY, SO IT SOUNDS LIKE – TELL ME IF THIS IS RIGHT OR WRONG – THAT THE CONTENT WAS NEVER FROZEN, BUT THE PAGE LAYOUT, THE POWERPOINT SCREEN FORMAT AND THE PACKAGING FROZE.
DESIGNER #1:
Not after prototype.
*Q17: NOT AFTER PROTOTYPE.
DESIGNER #1:
Well, when you say okay umm the learner's guide format froze after prototype. The screen designs the general formatting for the PowerPoint froze after prototyping. The instructor's guide was not frozen. The reference guide was not frozen.
*Q18: OKAY BUT IT [REFERENCE GUIDE] HAD NOT REALLY EVEN BEEN THOUGHT ABOUT.
DESIGNER #1:
No there wasn't even anything to review at that time. And the content for umm the course umm stayed umm we were making modifications on that right up to right even after the pilot. And the intent is that this is the course that is going to be high maintenance because the products and services were always changing.
*Q19: SO THE FACT THAT IT CHANGED AFTER THE PROTOTYPE REALLY WAS NOT A SURPRISE
DESIGNER #1:
No big surprise
*Q20: BECAUSE THAT'S JUST THE NATURE OF THE PROCESS THERE
DESIGNER #1:

The nature of the process. The other piece of it is it really depended on which set of eyes happened to be looking at the content on any given day. Two people all in the same department would still have different opinions about how their product should be represented.
*Q21: WHEN YOU HAD REVIEW MEETINGS OF THE I'M THINKING IN TERMS OF THE PROTOTYPE BUT WAS IT A MEETING WHERE EVERYONE CAME TOGETHER IN ONE PLACE OR
DESIGNER #1:
(He nodded)
*Q22: OKAY AND THAT'S HOW YOU ACTUALLY CONDUCTED THAT FIELD TEST KIND OF THING
DESIGNER #1:
Well, I'm not sure the prototype was conducted as a group. And then once after the prototype we had decided what was of serious concern especially to the instructional staff then we had I think probably 3 more meetings as groups to try and achieve consensus on how on the look and feel for the instructor's guide.
*Q23: AND EVEN THOUGH YOU HAD MET IN GROUPS THERE STILL WASN'T CONSENSUS WITHIN GROUPS
DESIGNER #1:
No because what would happen is certain people would be absent on that given day. And since consensus was required we the group may say yeah I think you know we're all on the same page so to speak or this is what we agree the page should look like and then that other person would umm have a lot of concerns. One of the problems we dealt with here that – and I wasn't aware of it at the time but I became aware of later – is we were dealing we were trying to create an instructor's guide for I think basically an experienced person to present. Meaning somebody who had some degree of knowledge about most of the products. And as it turned out there was especially one person who was going to be expected to instruct umm who was very unknowledgeable instead of saying ignorant. Umm it not only was she not knowledgeable about the content but she had no instructional background. And she wanted an instructor's guide with training sense. That became a major issue and added an incredible amount of time to the review and revisions. Trying to keep her happy with the way it looked, the way it felt, the way things jumped out at the page. She had a terrible fear that you know she was going to get up there and look stupid and not have an answer. And so she wanted every answer and every thing she could conceive of. That created again because it was a consensus culture that really created some dilemma as opposed to Ellen or the project sponsor coming along and saying umm we're drawing the line here. It doesn't need to go into that level of detail. It's incumbent on you Mrs. Instructor to fill in the gaps and the holes. But that didn't happen.
*Q24: FOR DELIVERY YOU SAID YOU WERE INVOLVED IN PARTICIPATING IN THE FIRST RUN OF THE COURSE AND MONITORING LEARNER REACTION. WERE THERE ANY CHANGES MADE AFTER THAT FIRST RUN:
DESIGNER #1:
Yes. Umm let me think a second here. I know that we well they were minor changes. There were a couple things that some of the learners pointed out in the

reference document. Umm they didn't think were accurate. We just you know reviewed them and made some minor changes and it seems like oh I know we modified we had a couple of activities and we modified the answer sheet for one of the activities to make it easier for the instructor to administer it.
*Q25: ANY OTHERS?
DESIGNER #1:
Nothing other than that that I recall that umm came out of it. Umm the reactions overall were good. Umm, I think again we kind of had to work on the instructor in terms of the instructor really just wanted to go strictly with the instructor's guide. And she thought that everything that was in there needed to be said and done and I needed what I wound up having to do was kind of taking her aside and saying it's a guide. Okay, read your audience on this stuff. But again that had to do with umm the level of knowledge and expertise of the instructor too being able to do that. But what did around that is especially for one section that she in particular became kind of lengthy and wordy, umm I put comments right I the instructor's guide about how far you need to go with this and then what's optional.
*Q26: HOW CLOSELY DID THE FINAL PRODUCT RESEMBLE THE PROTOTYPE? YOU MIGHT HAVE ALREADY ANSWERED THIS EARLIER.
DESIGNER #1:
It didn't look very much like it at all.
*Q27: AND THAT'S BECAUSE OF WHAT REASON?
DESIGNER #1:
Well, I think its because I'm not sure of what you mean by how it looked except that you know we're not talking about a CBT type thing. We're talking about here did the look and feel of the course change. Yeah because
*Q28: DID THE TOPICS CHANGE?
DESIGNER #1:
Yeah in fact everything changed. Part of that was because it became political. Umm, we were honing in on one or two products and all of sudden not only did we have to provide something on all the products but we also had to do a section on the services. So now we had a unit on product. We had a unit on services. Umm and the materials all changed. Umm even the look and feel. Well I don't think the learner's guide changed. We maintained our same format on that which was our basic PowerPoint you know learner's guide type format. But including the reference guide umm and the reference guides they changed considerably from the prototype. They were not going to be the same and that was why I say to me the prototype in this case served as basically a formative evaluation. And so we did, we went on and the clay was still soft. And we redid it. So in essence how do (?) what could have should have happened was maybe there should have been a follow up prototype session. Umm
*Q29: LIKE A BETA AND ALPHA...WAS THE FIRST AN ALPHA AND THE NEXT A BETA?
DESIGNER #1:
Yeah. Say okay now lets see how it works. Umm and instead I think what we did was have those consensus meetings of the instructional staff. And then we did the actual pilot. Which maybe was the beta.

*Q30: NOW THAT YOU'VE USED RAPID PROTOTYPING WHAT IS YOUR FEELING ABOUT IT?
DESIGNER #1:
In this circumstance in this kind of a context I don't think it was umm I don't think it was a benefit. And the reason I'm saying that is again like I said before umm its and instructor-led course. It I'm trying to look at it in terms of if we hadn't done rapid prototyping how would it have affected our time frame or our end product. And my hunch is the issues a lot of the issues that came up in the rapid prototyping were going to come up anyway. We were still one way or another going to have to hammer out what you want that instructor's guide to look like. Umm we were still going to have to make some decisions about how much and what content needs to be included here. Both because there were a lot of content reviewers at a higher lever and all of them were able to call the shots on it. So those things would have happened anyway. Umm what it did is it I find it to be kind of any interruption in the normal development process you know for an instructor led product. And that's what it did in this case. It tended to do that. I can see where especially if you dealing with something you know like a CBT-type product where there is a tremendous amount of expense umm in creating the actual materials that you don't want well you want to make sure that you're doing the right thing. Then there's a clear advantage in doing that rapid prototyping in that kind of situation because you want to make sure that everybody does have agreement on how that's going to look and feel so you can go forward and continue using that format. Umm in this case we the look and feel of the instructor's guide and the reference guide evolved as we were pulling together content; as we were realizing the extent of the scope. And as the scope changed because people at different levels wanted it to change. Umm and so I don't know that the rapid prototyping gained us anything in this case. Except for, I mean, at first an early review of some of the materials.
*Q31: OKAY. NOW IF YOU WERE TO SAY THINK ABOUT ANOTHER PROJECT THAT YOU WORKED ON OR MAYBE EVEN THIS ONE SINCE YOU KIND OF SOUNDS LIKE YOU MIGHT HAVE THOUGHT ABOUT THIS – A PROJECT THAT DID NOT USE A RAPID PROTOTYPING MODEL SAY A DICK AND CAREY MODEL WHERE THINGS ARE A LITTLE MORE LINEAR UMM HOW WOULD YOU DESCRIBE THAT PROJECT AS COMPARED TO THIS ONE. WHAT THINGS DID YOU DO DIFFERENTLY IN THE NON RAPID PROTOTYPING SITUATION FROM THE RAPID PROTOTYPING?
DESIGNER #1:
I think I tended to do things more I don't want to say this umm (pause) different pieces of the umm of the program of the project were at different stages at different times and that was okay. In other words the look and feel of the instructor's guide may not be very well developed, the content might be fairly far along, umm, the reference guide/reference document may not even have been started yet and that was okay. This is in terms of a more traditional model. In other words I can be doing more things in parallel and it was okay. Umm and start and stop at different points in time. It didn't all have to umm kind of be done at one time and especially early. That to me forces umm a lot of things to have to come together in a very umm short period of time before you may be necessarily have a

full concept of what the scope of the project may be. Umm that I guess my experience has been or my preference is to really kind of use that layers approach where you gradually dig into the depth that you need to in terms of the content and the materials gradually evolve. You have umm a dry run before a pilot where you bring all the stuff out and showcase it and say okay give me your reactions to it. You know and then you go and make your modifications and your final adjustments in preparation for the pilot. That's my other approach or experience. Umm for this kind of a course I think that would have worked fine. Again like I said there's not you're not looking at tremendous investment of financial investment or time investment of preparing materials – like computer-aided materials or something up front where you need to have an answer on that. Even if I did even if I envision that as being umm a major expense then probably what I would do is I would I would work up that you know an example of that particularly piece early on and get a review and agreement on that. As opposed to pulling together a whole umm scene out of a play so to speak early and say okay lets try this out and see how it works. The other problem that you run into in that and we did experience in both rapid prototypes I did, if you take a slice out of the middle of something umm the instructor finds himself saying well I would have told you this stuff before or this is yet to come. The instructor it isn't normal in that sense unless you happen to do the introductory piece. If you take a piece out and the piece you're suppose to be trying in rapid prototyping is the one you think you might have you'd be struggling the most with. Not necessarily the introduction. So there is a problem with that.

*Q32: NOW ONE THING THAT YOU SAID THAT I THOUGHT WAS INTERESTING IS IN DESCRIBING THE TRADITIONAL SITUATION YOU SAID THINGS WERE DONE IN PARALLEL. AS OPPOSED TO SIGN OFFS. TYPICALLY I SHOULDN'T SAY SIGN OFF...FROM MY EXPERIENCE IN A TRADITIONAL SETTING I MIGHT GET ALL THE CONTENT FOR THE COURSE AND WRITE THAT UP. IT PROBABLY WOULD NOT BE IN THE FORMAT THAT I WANTED IT IN BUT I'D WRITE IT ALL UP. HAVE SOMEONE LOOK AT IT. THEY'D SAY OH OKAY THAT'S FINE OR NO MAKE THESE CHANGES AND THEN I WOULD MOVE FORWARD TO COMING UP WITH THE LAYOUT.

DESIGNER #1:

The development stuff

*Q32: (CON'T) MMM. AND I GUESS MAYBE WHILE THEY'RE REVIEWING IT I MAY START THE PARTICIPANT'S GUIDE. IS THAT WHAT YOU MEANT WHENYOU SAID IN TERMS OF PARALLEL.

DESIGNER #1:

Well, I kind of hear what you're saying but I guess I think I look at it again like more of the layers approach where what I do what tends to happen is I take a first cut at the content. Okay, umm I get a sense of the scope. You know for example if I'm doing something on evaluation. Umm I'm going to go out, I'm going to touch base. I'm going to do some extant data analysis and kind of pull together the main concepts and ideas and get an idea of what's the sequence and the logic and the flow here. And put that together. And then I'm probably going to start working with some SMEs and run that content by. Once I've gotten their reaction to that

initial stuff I'm also thinking about and starting to pull together at least mentally umm how what's the formatting going to look like in the instructor's guide. And so at the same time once I have an initial read on that very first bit of content I'm going to go ahead and try to incorporate that into the instructor's guide format because I want to get some early review on that as well and the learner's guide. So I know nothing is done. Nothing is solid. You know the dough is soft everywhere but it's enough that I can begin to put some materials together and start getting some reaction on that part of it as well. So I'm trying to yes sequentially I still have to get content first, and then I start doing some development. But I do it on this layer and then I going back and getting you know more detail content and the same time I'm getting more detail input on that instructor's guide stuff. Umm and then the learner's guide and then I'm also saying what are we going to do for additional reference materials and such. Do I need to be developing a glossary? Is there going to be job aids that need to long with this. Is there a reference guide we need to be creating? I mean those are questions that start coming in as I start digging deeper into the content stuff. Umm and that's also when the strategies start coming out too. How what's the best way to start getting this stuff in place. Umm but I think all of that is kind of going on at the same time anyway because as soon as you start outlining content part of your thinking is okay how what are my objectives here. And you know what are some reasonable ways of trying to get this material across. So some where along the way I've got to be ready and it's got to be somewhere in the early, late early stage or the middle stage of the process. I've got to be able to run strategies you know by people too. And start refining those. So maybe that's kind of what I'm saying is that there's this refinement process that is constantly going on. This iterative process.

*Q33: WHICH IS HOW RAPID PROTOTYPING IS DESCRIBED AS BEING ITERATIVE AS OPPOSED TO LINEAR.

DESIGNER #1:

Sequential and linear. Yeah and there's a combination of the two kind of go there. And I can see like I said I mean clearly there is a value in certain instances where taking that umm sample final product and that to me what I'm looking at with rapid prototyping. Here's a sample of what we're thinking this product is going to look like. You know it's only 10 percent but how does it match up with what you were expecting Mr. Customer. And that's fine especially when where there is a clear need to do that. Especially like I'm saying with the electronic media stuff where the expenses are incredible to pull the stuff together. You want to make dam sure that everybody's on the same page and they're in agreement in doing that. Umm, but I do find it to be an interruption if you will. Kind of a forced intrusion into my the usual way of trying to pull a course together.

*Q34: OKAY. WHAT WOULD YOU DO DIFFERENTLY WITH RAPID PROTOTYPING OTHER THAN NOT USE IT?

DESIGNER #1:

How would I? I guess I don't have a problem with well I guess rapid prototyping to me again is a type of formative review. As a formative it is an early formative evaluation. Umm and it may only be of a small piece. Well I believe in doing early formative evaluations. Only I do it of pieces. I don't try to pull all the pieces together at the same time early on at the review. And so I don't disagree with the

idea of doing early formative reviews as early as possible. It's a matter of do all those pieces have to be done and functioning together at the same time umm for a prototype.
*Q35: WHICH I THINK SUPPORTS WHAT YOU SAID EARLIER THAT YOU'D HAVE MORE THAN ONE PROTOTYPE. AND MAYBE THAT'S THE THING THAT CAUSED SO MUCH FRUSTRATION WITH THE PROJECT THAT YOU WERE ON. YOU HAD ONE PROTOTYPE AND THEN BOOM YOU WENT RIGHT INTO THE PILOT.
DESIGNER #1:
Yeah. We went from there to the pilot, right. Umm my preference probably would have been to have not done the prototype but to have done a dry run.
*Q35: WOULD YOU HAVE HAD ENOUGH INFORMATION TO DO A DRY RUN EARLY?
DESIGNER #1:
No not at that point
*Q36: OKAY SO YOU WOULD HAVE JUST TOTALLY ELIMINATED THE PROTOTYPE AND LATER DID A DRY RUN USING THE MATERIALS
DESIGNER #1:
Right.
*Q37: OKAY. AND THEN A PILOT?
DESIGNER #1:
Yeah because one of the things that happened with the rapid prototyping too is there was a lot of time spent arguing essentially about content issues. Umm and I think with the rapid prototype a lot of what you're looking at yeah there are questions about the depth of coverage but a big piece of what you're wanting to know is the look and feel stuff. Is this what you're expecting it to look and feel and operate like. Umm and if you get distracted and caught up in the politics of content issues while you (he slapped the table) paying too much attention to that product and not enough to this one. Then you miss the time opportunity to hone in on what you really want to do. So maybe that's not a piece of rapid prototyping is you kind of need to go in knowing what it is you want to come out of there with and being able to direct the troops in those ways. There are special skills that go into doing this.
*Q38: RIGHT. WAS YOUR CUSTOMER SATISFIED WITH THE QUALITY OF THE PRODUCT?
DESIGNER #1:
Yeah, I think in the end umm there was they were pleased with what we came up with. I know the reference guide was very well received throughout the company, and that was not an intended product.
*Q39: OH GOOD! WERE YOU PLEASED WITH THE PRODUCT?
DESIGNER #1:
Yeah, I'm never absolutely 100% satisfied. You know but for given all we had to go through yeah I was. Umm I thought we came up with a product and the product had more how do I want to say it there was more depth included in the instructor's guide than I expected or intended. And again that was because we weren't necessarily using experienced instructors. And that was probably a miss conception when we initially scoped the project. Umm but then again because of

things that were going on internally this particularly project was delayed in completion by probably umm 3 or 4 months. And so in that interim things changed. The instructional staff changed. The people in the positions to support it changed and so you know that did change our end product from what it was intended to be or what we originally conceived it to be.
*Q40: SO EVEN THOUGH YOUR ACTUALLY DAYS WERE 2 ½ MONTHS FOR ONE COURSE IT REALLY STRETCHED OUT OVER A 4 MONTH PERIOD OF TIME BECAUSE OF ALL OF THE TURN OVER AND OTHER ISSUES?
DESIGNER #1:
Yeah. We umm I think we initially we did our kick off meeting on the two projects together. It might have been January or maybe around February and this product was actually turned over probably a year ago.
*Q41: WHICH WOULD BE... LET'S SEE THIS IS WHAT? OCTOBER. WERE ANY OF THE SMES OR WAS THAT ONE SINGLE KNOWLEDGEABLE SUBJECT MATTER EXPERT IN THE KICKOFF MEETING?
DESIGNER #1:
No.
*Q42: WHO WAS IN THE KICKOFF MEETING?
DESIGNER #1:
Umm the (pause) well see that's a good question. We didn't do a kickoff meeting for each product. We did a single kickoff for both products back in February might even have been January. So who was in that meeting was human resources, umm the HRD guy, umm the training director if you will and the training the facilitator or coordinator person. Umm I can't think of if anybody else was there. It seems like they did. Umm it doesn't jump out at me right now. And then we had myself, the sales personand our project manager.
*Q43: OKAY. ONE MORE QUESTION REGARDING THE SINGLE SUBJECT MATTER EXPERT. WOULD THAT SINGLE INDIVIDUAL BEEN ABLE TO HANDLE ALL 11 TOPICS?
DESIGNER #1:
Supposedly he was knowledgeable enough that if he couldn't he had access to the people who could give him the specific details. In other words he might have been what we would consider a coordinator subject matter expert. Umm but at least he was a single source. And he was in the sales group. So you know he sold the different products. So that's why he was knowledgeable and he had access to a lot of the information. The literature around all of the different products. What are we telling our customers about these things so that's why he was a key person. When we lost that person there was no one else in sales or anywhere else who had that depth or breadth of knowledge. So we wound up going to the specific specialists on each topic area. And the other thing that was frustrating in this situation was the coordinator insisted on operating as the what's the word? As the key you know any way.
*Q44: THE PROJECT LEADER?
DESIGNER #1:

Well but insisted that everything go through her. So that I didn't I couldn't make those contacts with subject matter experts myself. She had to arrange the meetings. Which really complicated things from a time perspective.
*Q45: OKAY. IS THERE ANYTHING ELSE THAT YOU WOULD LIKE TO TELL ME BEFORE WE CONCLUDE?
DESIGNER #1:
Well, regarding rapid prototyping in particular?
*Q46: YEAH.
DESIGNER #1:
Oh. I'm trying to think if there was anything else. I guess I don't think there is anything else in particular around the rapid prototyping. That was kind of my experience. Would I use it again? Yeah I would use it again under the right circumstances. Umm, and maybe that's one of the things that kind of needs to be look at is what's the most appropriate application of this model. Part of it though I think is what works there's a designer/developer issue and a customer/client issue that kind of goes along with this. As a designer/developer umm I felt like rapid prototyping was forcing a lot of issues maybe a little too soon and one of the problems with the whole thing is when you set the date for rapid prototyping typically you do that at the kick off meeting. Umm, man that can be a big mistake and maybe that was one of the problems we were dealing with. It's we locked in on this date but don't really know what we're getting into. I know that in the first project that was involved. We didn't understand the scope of what needed to be done. So that's just one more consideration for rapid prototyping. Look at how do you decide on when it should be done. That's a key issue for me because from the moment you walk out of the kick off meeting you have this umm deadline that you're automatically starting to work towards and you don't know if you're going to have access to everything and all the people and everything else. Especially with a new client where everybody is kind of feeling each other out and like I said I didn't understand the consensus process there. I never expected that. So you know again there are things that just add time to the process umm that you don't have to go over, that are kind of contingent on the client. And so rapid prototyping umm kind of hinges too on umm how well you can work with everybody. Cause one of the things that I think is a mistake is to go through that kick off meeting umm and set a date and say on such and such a date 2 months from now we're going come in and show you that slice. Umm that true-life slice of how this is going to look because what it does is it clearly sets up an expectation on the client's part that that's going to happen. And then you talk about design freeze and that kind of scares them a little bit. Umm oh shoot now we've got to definitely make decisions that are umm. I think it puts quite a burden on the umm designer/developer too to have something umm ready to go by that point in time. Not knowing what the nature of the puddle is he's really stepping into. And I guess maybe one piece of that is there should be a better way to establish that date for the rapid prototyping and I think it should be more based on some percentage of completion of something. As opposed to simply pulling an arbitrary date out of a hat when everybody's available.
*Q47: DO YOU THINK THAT YOU IF YOU HAD DONE THIS PROJECT OR A SIMILAR PROJECT USING A DIFFERENT MODEL A NON RAPID

PROTOTYPING MODEL THAT IT WOULD HAVE BEEN DONE ANY QUICKER OR WOULD IT HAVE TAKEN LONGER. DID RAPID PROTOTYPING SEEM TO MAKE THIS GO ANY FASTER? THAT FASTER, BETTER KIND OF CONCEPT?

DESIGNER #1:

I keep going back to the umm time that seemed to get lost after the rapid prototyping meeting when we spent so many sessions trying to agree on a look and feel for the instructor's guide. You know that seemed to go on for 3 or 4 weeks. You know just trying to get everybody to agree on it. Now I was spending a considerable amount of time redesigning and redoing that document. Umm and I'm wondering I don't know if one of the problems well I don't know. What would have happened is I still would have had to deal with that issue but I wouldn't also have been trying to do the other pieces had I waited until the dry run because the content would have been a lot more solid by then. The reference guide stuff probably would have been a lot more solid by then too. Umm and then I could have then I wouldn't have felt so I really felt like I was off track just trying to work on this format issue. And I knew I was not spending the time developing the content and the materials. It was like I couldn't be focused on both at the same time. So it that was one of the things that came out of the rapid prototyping meeting. On the other hand that's one of the things that's suppose to come out the rapid prototyping meeting (pause) is that – the look and feel that you want to experience. Umm, and so I guess it didn't add maybe the best answer is it didn't add time, it added pressure and stress for me. That's what I find rapid prototyping does. It's stressful.

*Q48: IT'S STRESSFUL. I HADN'T THOUGHT OF IT IN THOSE TERMS. THAT'S A GOOD WAY TO LOOK AT IT THOUGH.

DESIGNER #1:

From a designer/developer perspective the stress starts the moment they say okay what date do you want to do the rapid prototype. Other than that that's it before the tape ends.

*Q49: ACTUALLY THAT'S ALL THAT I HAVE UNLESS YOU HAVE SOMETHING ELSE.

DESIGNER #1:

No.

Transcript 002

*Instrumentation for the Telephone Interview with Emdicium Employees
*Interview Transcript for Designer #2
October 24, 1997
*Q1: THE FIRST SET OF QUESTIONS I'M GOING TO ASK YOU WILL DEAL WITH YOUR ACTUAL RESPONSES JUST SO THAT I CAN GET A LITTLE BIT OF CLARIFICATION.
DESIGNER #2:
Okay.
*Q2: THEN I HAVE ABOUT EIGHT QUESTIONS I MAY ASK. DEPENDING ON WHAT KIND OF RESPONSES I GET HERE I WON'T ASK YOU ALL OF THE EIGHT
DESIGNER #2:
Okay
*Q3: WHAT WAS THE ESTIMATED PROJECT TIME THAT WAS ON THE PROPOSAL THAT WAS SUBMITTED. DO YOU REMEMBER?
DESIGNER #2:
I don't remember. What I do remember I think we started in August or July. I remember the proposal time took absolutely forever. I wasn't involved with the proposal because Another Emdicium person was supposed to do the project. So proposal time might not have been accurate because by the time they got it approved we then became in a rush. It took over a year to get the proposal through. Get it actually implemented. By the time I actually started I think it was sometime that summer august comes to mind. They were actually implementing and needed the class by January. So the time was we had like about umm 5 months or something like that to get something implemented. I don't know what was in the proposal.
*Q4: OKAY. THIS WAS A NEW SYSTEM THAT WAS CREATED?
DESIGNER #2:
Yes. Hmm a new system
*Q5: THE INSTRUCTIONAL STRATEGY INCLUDED THE ON-LINE TUTORIAL AND
DESIGNER #2:
The instructional strategy was umm lets see the on-line job aid, okay, the an on-line tutorial which we could not be implemented immediately because of the time frame and then for everybody so we went about doing one just for the readers, cause we had to write or create our own authoring tool. The authoring tool didn't exist for the type of umm programming that was being done. Umm and then a class a hands-on class.
*Q6: AND THE CLASS HAD INSTRUCTOR'S GUIDE, PART
DESIGNER #2:
Instructor's and a very small participant's guide. Umm I think that was it
*Q7: NO POWERPOINT?
DESIGNER #2
NO

*Q8: NOW ON PAGE 4 FOR DEVELOP HIGH LEVEL CONTENT OUTLINE, YOU HAVE NA I GUESS THAT MEANS NOT APPLICABLE.
DESIGNER #2:
Yeah
*Q9: AND SAME THING FOR IDENTIFY CONTENT FOR THE PROTOTYPE YOU HAVE NON APPLICABLE. WHY IS THAT?
DESIGNER #2:
We didn't do a high level content outline
*Q10: DO YOU REMEMBER WHY NOT?
DESIGNER #2:
Time I think. We did I don't want to say it was a real lot of content but it was the system. The system was organized. I mean we had to identify the business process and the system and the tool were really well integrated. So the content was just the system we didn't if we did a high level outline it was all tied in with the design concept memo. It was all integrated. Umm and identify the content for the prototype, all we did was, umm if my memory serves me correctly and based on my timesheets, as part of the design concept memo I looked at just one section and said okay that's the section. Oh the user's guide that was the other part we had to do. We did a user's guide which was documenting the system. And umm we just pulled one section. What I did was I did an outline for the user's guide. Maybe that 's the high level content outline. Umm we used that and I just said okay we're going to take this one section and develop it in more detail.
*Q11: THAT ONE SECTION BECAME THE PROTOTYPE?
DESIGNER #2:
Yeah.
*Q12: OKAY. THE PROTOTYPE...WAS IT ELECTRONIC OR PAPER OR BOTH?
DESIGNER #2:
Paper. I think it was umm just the prototype for the user's guide and the very first section for the instructor's guide for the umm stand up class.
*Q12: OKAY BUT NO PROTOTYPE FOR THE JOB AID OR THE ON-LINE TUTORIAL
DESIGNER #2:
No we couldn't do those because we didn't have we had to get the umm the authoring tool done. And without the tool we couldn't do the prototype. We I mean it was a word description it wasn't an actual prototype. Our prototype for it was we basically said we're going to do something like word what has with a stay on top how to box. Word has those and that was basically our example of what we were going to do
*Q13: OKAY. HOW DID THEY REVIEW THAT?
DESIGNER #2:
The prototype?
*Q14: YEAH.
DESIGNER #2:
Umm with a gang review where we just sat down. I think we did it in here or down at Organization #2. I don't remember. We just went around the table and we just went through it. We passed it out to them before hand and they went through

it and made any mark ups and umm any anticipated changes. And umm basically they weren't into layout. They didn't care what it looked liked. Umm that was always the impression I got that as long as it was clean and it contained content that was accurate.
*Q15: WHEN THEY REVIEWED IT DID THEY LOOK FOR CONTENT ISSUES
DESIGNER #2:
They did as best they could but they didn't know the system any better than I did. Umm cause those who reviewed it were not the systems people. They were I mean the ultimate client. We had two clients here which we were working for systems and although he was...Tom Lahyer works for systems... and he was involved. Umm he wasn't a developer and umm so and then we had the users who were the ultimate client. And they looked a little bit for content but it was still a little loosey goosey.
*Q16: WHO WAS IN THE REVIEW MEETING? THE SYSTEMS PEOPLE OR THE USERS
DESIGNER #2:
If my memory's right it would have been umm John, Frank umm, Don Fosh. They were all users. Sheryl...Sheryl Harris was involved. And their concern was to get something out the door on time.
*Q17: ALL RIGHT. WHEN YOU GOT THE AGREEMENT REGARDING THE PROTOTYPE WAS THE CONTENT FROZEN?
DESIGNER #2:
It was frozen as best it could be cause the system wasn't done. What was frozen about it was we had designed it – okay we designed it around the business process – the user's guide. And that's what we were really reviewing we did a prototype of the user's guide and I designed it around the business processes. And that part was frozen the business process. We had a big discussion about what needed to be in various sections. And yeah I want to say that was frozen. It is still that way till this day. Umm the content changes are system changes. We still have discussions about were things belong but essentially it was frozen
*Q18: SO ESSENTIALLY, IT I'M UNDERSTANDING WHAT YOU'RE TELLING ME, YOU DID A PROTOTYPE OF THE USER'S GUIDE ONLY.
DESIGNER #2:
Umm.
*Q18 (CONT'D): NO. THE USER'S GUIDE AND THE INSTRUCTOR'S GUIDE.
DESIGNER #2: They were paper prototype types.
*Q18 (CONT'D): AND UMM THE CONTENT FOR THE USER'S GUIDE WAS FROZEN AFTER THE AGREEMENT ON THE PROTOTYPE.
DESIGNER #2:
I think so.
*Q19: WAS THAT TRUE FOR THE INSTRUCTOR'S GUIDE TOO?
DESIGNER #2:
Umm we developed that last. So I think that was also *(I'm not sure what her last word was for this response. It sounded like also but I am not certain since her voice was barely audible)*

*Q20: HOW DID THE INSTRUCTOR *(I MEANT TO SAY REFERENCE)* GUIDE AND PARTICIPANT'S GUIDE DIFFER?
DESIGNER #2:
Oh, the participant's guide...all that was contained in it was scenarios. Umm, so it was maybe four or five pages long. And umm we did not have content for that. That took having a completed system.
*Q21: AND THE USER'S GUIDE WAS MORE OF A REFERENCE DOCUMENT?
DESIGNER #2:
Yeah the user's guide was a reference document. It contained all of the procedures. The how to's. Which were eventually also included in the on-line job aids.
*Q22: THE PILOT IS ON PAGE 6. OKAY UNDER REVISE THE PRODUCT YOU SAID YOU MADE REVISIONS TO THE FACILITATOR/INSTRUCTOR'S GUIDE, REVISIONS TO THE USER'S GUIDE. WERE THESE REVISIONS DIFFERENT FROM THE REVISIONS THAT YOU MADE TO THE PROTOTYPE?
DESIGNER #2:
Umm, they were in addition to the prototype. We didn't have any screen captures. I mean we had one or two. We showed them how the screen captures were going to be. We I bet you the prototype at that point, and I'd have to really dig for it if we still even have it, was maybe 10 pages. It was just purely looking at layout issues.
*Q23: AND THE LAYOUT STAYED THE SAME?
DESIGNER #2:
The layout stayed the same until our most recent update. And umm it was looking at layout issues, looking at organizational issues, the table of contents umm, things like that and that pretty much stayed the same until this most recent update.
*Q24: OKAY AND THEN WHEN YOU DID THE PILOT TEST THE CHANGES BASICALLY WERE THINGS THAT YOU HADN'T DONE BEFORE?
DESIGNER #2:
Yes. Umm when we did the pilot test with the umm that was mostly with the class. With the user's guide to support it. It was you know what did we miss in the content. Did the examples work? Did the class flow. Umm and then we made any revisions based on that.
*Q25: OKAY. NOW, I'M GOING TO ASK YOU THIS. I ALREADY ASKED THE CLIENT BUT I HAVE TO ASK YOU TO. DID YOU EXPLAIN THE RAPID PROTOTYPING PROCESS TO THE CLIENT?
DESIGNER #2:
We did.
*Q26: DO YOU RECALL HIS...IT WAS HIS...HIS REACTION TO?
DESIGNER #2:
I think it was pretty positive. If my memory is right. Umm it was we had just started using the rapid prototyping umm. I think I was still feeling my way with it. I believe my memory's right that everyone, you know, was cool with it. Had no questions.

*Q27: ALL RIGHT. NOW THAT YOU'VE USED IT WHAT'S YOUR FEELING ABOUT RAPID PROTOTYPING?
DESIGNER #2:
Umm, I think it puts something in front of the client up front really early and helps them see what their final project product is going to look like. So it can be real useful to a project. Even if its just sketching out what something's going to look like.
*Q28: OKAY. UMM DO YOU...WHAT WOULD YOU DO OR HAVE YOU DONE DIFFERENTLY SINCE THIS PROJECT WHEN USING RAPID PROTOTYPING?
DESIGNER #2:
Umm, I try and get as much information up front as I can. Get as much from the client as I can. Umm get that content frozen. They'll get a faster better product in the end.
*Q29: OKAY. UMM LET'S SEE. NOW IF YOU WERE TO COMPARE THE PROJECTS WERE YOU HAD DELIVERABLES SIMILAR THIS. SAY AN INSTRUCTOR'S GUIDE, USER'S GUIDE, A PARTICIPANT'S GUIDE THAT YOU WORKED ON BUT DID NOT USE RAPID PROTOTYPING HOW WOULD YOU COMPARE THE TWO SAY IN TERMS OF THE AMOUNT OF TIME IT TOOK YOU TO DO IT, UMM THE AMOUNT OF REVISIONS THAT WERE MADE, WHETHER YOU GOT DONE WITHIN THE BUDGET AND ON TIME, ETC.
DESIGNER #2:
Probably umm CASE and Ameritech. I don't remember too much about Ameritech. CASE was one of those were we were constantly going back and making changes. Now whether those were system...I don't know if those were system changes or as much as details. We did this huge long design up front. Warranty was another one. We did this huge design. Umm we did this huge long design project with these long design documents. But they didn't really define what the deliverables would look like. So therefore deliverables had to be changed well into the project which umm I remember working absolutely hours on CASE and Warranty making needley changes. You know the details... when I walked out of CASE I went the details will get you ever time. Umm, I don't in GPLUS the changes more umm system changes. Not umm although most of my clients were pretty cool you know about layout you know. They'll accept whatever layout I put out there for them. But umm the more content you can get up front and say yeah this is what we're training on. This is our design; the easier it is.
*Q30: UMM, IF YOU NOW THE STEPS THAT WE HAD OUTLINE HERE ON THIS DOCUMENT WERE THE STEPS USED TO DO THE PROTOTYPING. USED TO DO THE RAPID PROTOTYPING. ARE THERE STEPS WELL I KNOW SUPPOSEDLY WITH RAPID PROTOTYPING ITS ITERATIVE. YOU MAY GO BACK AND USE STEPS BEFORE, YOU MAY DO STEPS IN PARALLEL, YOU MAY NOT DO SOME STEPS. IN USING A MORE TRADITIONAL MODEL UMM
DESIGNER #2:
It's more linear

*Q31: IT'S MORE LINEAR. OKAY AND DO YOU SEE THESE SAME STEPS BEING THERE OF COURSE EXCLUDING THE PROTOTYPE STEPS?
DESIGNER #2:
Umm we identify the audience. We identify the instructional need. We have to identify the content. Umm have to identify the strategy. Those I always use. Umm they're not necessarily in the same order. You have to identify the content and you do the strategies, but usually your design document contains just the strategies and doesn't contain much content. Umm you don't get the content in detail as early. And so you're designing based on what you think you know about the content. And if you get (pause) the more information you get about the content and your audience, the better your design's going to be. It's less changes. In fact that's what I had to change in CASE. I had to add a whole unit to my design because I missed a whole piece.
*Q32: AND THAT'S BECAUSE YOU DIDN'T REALLY LOOK FOR ALL THE CONTENT UNTIL AFTER THE DESIGN CONCEPT MEMO WAS DONE?
DESIGNER #2:
Yeah, right. I wasn't using a design concept memo I had the design document.
*Q33: DESIGN DOCUMENT, OKAY.
DESIGNER #2:
Right, it was you know a design document and that design document I bet you was 30 or 40 pages long. And
*Q34: WHAT TYPE OF STUFF WAS IN IT?
DESIGNER #2:
Oh, it was...we were doing Phoenix at the time so I had to define all the units. And unit A would contain this information and unit B would this and it was the objectives. And given you know there had to be an objective for each unit or more than one objective. And umm, I bet you we still have it but it was you know it was real detailed but it didn't necessarily talk about how you know there was a whole piece in there that I remember having to go back and add a unit. Because as I writing the training and doing it I went we missed a piece. It's also the first one I had to design by myself here. Okay, so umm. But umm lets see umm, don't really do that high-level content outline which is probably again that gathering of content and organizing it. Umm, and then if you know we don't do the prototype. It we go into a lot of umm drafts. Draft one and then you revise it and then draft two and then you've got to review it. And draft three. And then you go back and oh well no I really wanted it to be that way. It's a lot of lot more iteration I think. You've gotta I remember we use to have like two or three drafts. We still go through that a little bit here you know because you know it goes to the editor, and but I remember actually having check sheets so you know who's doing the different reviews. Because our content reviews and design reviews and system reviews and umm, maybe it cuts down a little bit on the review cycle time.
*Q35: OKAY. HOW IS THAT?
DESIGNER #2:
Umm, God it's so project dependent. It depends on the client and the type of...whether you're doing an editor, whether it's a systems project. Umm, if you

can get all the content and you've got it all up front so that you can get it organized. Umm, if they don't start feeding you the content till later you have no idea if your design is right...if you organize the content correctly.
*Q36: SO IS THAT SOMETHING THAT COULD CONCEIVABLY HAPPEN WITH RAPID PROTOTYPING TOO?
DESIGNER #2:
If you didn't get that content early enough. Or if you didn't identify your audience. If you didn't have that audience information. I'm trying to think whether we did any rapid whether we did what you would consider rapid prototyping on Parts Releasing. Umm, I don't think we did. I mean we did well I don't think so. I'd have to look at it. Umm, but we spent a lot of even in the rapid prototyping we spent a lot of time getting the content up front. Making sure the process was right. Umm, which made writing the class a lot faster.
*Q37: I'M THINKING ALONG THOSE LINES. I TRYING TO THINK OF SOMETHING ELSE I WANTED TO ASK YOU. UMM, OH, WITH SOME PROTOTYPES THERE IS LIKE AN ALPHA PROTOTYPE AND A BETA PROTOTYPE AND HOPEFULLY THAT'S IT IN TERMS OF PROTOTYPES. AND YOU WERE SAYING THAT WITH A TRADITIONAL MODEL YOU MIGHT HAVE TWO OR THREE DRAFTS
DESIGNER #2:
Is there really that big a difference between them?
*Q38: RIGHT THAT'S MY QUESTION.
DESIGNER #2:
And I don't know I haven't really done enough with prototyping. What I've never been involved in is actually like in GPLUS conducting a partial class using the prototype to see if it works. That might be useful in some situations. Umm, I think it depends on what your prototype is.
*Q39: WITH THIS THOUGH IT SEEMS AS THOUGH YOU ONLY HAD ONE VERSION OF THE PROTOTYPE?
DESIGNER #2:
Yep only one version of the prototype and I think that with this prototype it was more umm, getting the organization of everything correct. You know even the layout you know working. The layout of this was getting the graphics in there. The screen captures with the process and umm, everyone seemed yeah that's cool if you can do go for it. A lot of times maybe its getting the technical bugs worked out early.
*Q40: BUT WOULD YOU REALLY YOU MEAN TECHNICAL BUGS AS FAR AS IF YOU'RE DOING LIKE A CBT OR ON-LINE TUTORIAL OR SOMETHING? WHAT DO YOU MEAN AS FAR AS THE SYSTEM IS CONCERNED?
DESIGNER #2:
No, even umm like in word inserting graphics and not having you know doing it almost like building a macro. It's easy to get the graphics in, replace them as needed umm getting all that umm. What we did here is there was a second person working with us with me on this originally and just building a template. You know those technical types of issues. Her problem was she didn't know how to use a template, which is something I dealt with here. But umm that's one of the issues

that use to come up with Mara Louise a lot. Umm, getting all of the technical issues out of the way so you can just go in and actually just write.
*Q41: SO IN THE CASE OF UMM SAY AN INSTRUCTOR'S GUIDE THE DIFFERENCE WITH THE PROTOTYPE VERSUS A TRADITIONAL MODEL IS THAT WITH THE PROTOTYPE YOU'RE ACTUALLY PUTTING TOGETHER THE INSTRUCTOR'S GUIDE IN THE FORMAT THAT ITS GOING TO BE IN.
DESIGNER #2:
Right, which says that once you collect the rest of the content if you don't have it. You should be able to just go in and drop it in. That would be you know, go in and drop that content in if the content's correct and they'll you know then you should have a faster product.
*Q42: DO YOU THINK THAT YOU REALLY HAVE A FASTER PRODUCT? YOU KNOW THAT SAYING FASTER, BETTER, CHEAPER? (LAUGHTER) WHAT DO YOU THINK?
DESIGNER #2:
Yeah right. Umm, sometimes if your content is good and solid. And they don't do a lot of word smiting. If the client doesn't want to get a lot of input into it, then yes, I think you can have a faster product.
*Q43: BUT I THOUGHT ONE OF THE ADVANTAGES WAS GETTING THE CLIENT INPUT.
DESIGNER #2:
No, no, no, client input first. I meant you get all of the client input first. If they don't change their mind you know.
*Q44: TYPICALLY DO THEY CHANGE THEIR MIND?
DESIGNER #2:
Some do some don't. I haven't had too many problems with it but I think other projects have. I haven't noticed much though. Maybe its asking the right questions up front to make sure you've gotten the right information. Umm so you make sure you're prototyping the right thing. Okay cause you can put together the best prototype and have it signed off on it. Then when you actually do the product you find out you prototyped wrong or the prototype you've done you pulled out one section and that was a real simple section and it worked right for that content. Then when you get more into the other content that maybe you didn't know about. You've prototyped the wrong section. Now this prototype doesn't work given the new information.
*Q45: HOW DO YOU THINK YOU CAN GET AROUND THAT?
DESIGNER #2:
Oh, like I said you've gotta ask the right questions. You've gotta take it's hard. You can't get down into the details too early. You gotta get that macro look. Umm
*Q46: BUT THE PROTOTYPE WANTS YOU TO GET INTO DETAIL.
DESIGNER #2:
Real fast. Yeah right. But you have to...before you can get into that prototype you've gotta do that that up front analysis of the content of the subject. Because prototypes coming off of your design concept memo. Where you're writing your objectives, you're writing your design. You're organizing your material. Umm,

you know that good old design stuff. And you're taking that big subject matter – you're breaking it down into its little pieces and putting it back together again. And you've gotta ask the right questions I guess.
*Q47: SPEAKING OF THE DESIGN CONCEPT MEMO. A LITTLE WHILE AGO YOU SAID THE DESIGN UMM, WHAT WAS IT. THE DESIGN DOCUMENT THAT YOU DID WAS 30 PAGES OR SOMETHING. IS THE DESIGN MEMO DIFFERENT AND IF IT IS WHAT MAKES IT DIFFERENT?
DESIGNER #2:
It is shorter. It contains a different type of detail. Umm, I think I can find a design concept memo and a design document. Umm, maybe when we're done here I'll see if I can find it. Umm to look at the difference between em. Umm, the design concept memo is done many times with the client sitting there with you. We did that. We did that in Warranty although it took us a longer time. We actually designed the activities with the client. Okay, umm you can even do it now if you set up a notebook and actually you know start entering the stuff into a notebook. The design document you may go away and try and write this. And give it back to them and hope you give it back to them in a way that makes sense. So the design concept memo should be something you do with the client. Get a lot more client input. Umm, which should give you a better product in the long run. Because if they've done it with you then they know what to anticipate. They know what they're going to get.
*Q48: OKAY. UMM, ONE OF YOUR STATEMENTS WAS "WE WERE ABLE TO PRODUCE A HIGH QUALITY PRODUCT VERY QUICKLY USING RAPID PROTOTYPING." DO YOU THINK THAT YOU WOULD HAVE BEEN ABLE TO DO THE SAME THING A [NON-] TRADITIONAL MODEL?
DESIGNER #2:
I don't know. Umm, I was amazed. Since I've been on this project I was on that project over 3 years. And I had forgotten how fast we got something done with a full class written and a full user's guide written in like 4 months. Umm, that was really high quality. It stayed for almost 3 years. In fact, the class was never, over 3 years under I think 3 or 4 different versions of the software, it was never rewritten. It should have been but yet it was still working. Until they were going to the new version of the software it was still functioning as a class. So I think umm, in a very short time we got some good product out there that everybody was happy with. Umm, could we have done the same thing? Umm, I think it would have this was a good client so they didn't umm they didn't ask for a lot of you know they didn't get into the details. Umm, we probably could have but I think we would've had a lot the review cycles would have been longer. So given longer review cycles umm, that would have added time. And to pull time out you've got to shorten the review cycles. We didn't need as many reviews. With the design concept memo we were able to put the prototype attach that to the design concept memo and do just one review in what might have taken 2 or 3 reviews. Cause in the past what we would have is we would have done a review for the design document, taken it away, possibly had to revise the design document and review that again. Then go away and develop the product and then review that and then go back and make all of the revisions to it. Review it again and possibly make even more revisions. Umm,

given the design concept memo with an attach prototype. The prototype is part of the design concept memo. Umm, we went through the objectives and the class organization and then looked at a representation of what we were talking about. And said this is what we'll be giving you. This is what it will look like. This is the organization of the content in the user's guide. They said oh that's great. I was able to go away and get started.

*Q49: OKAY, I'VE GOT TWO MORE QUESTIONS. SOME PEOPLE SAY THAT RAPID PROTOTYPING IS ANOTHER FORM OF FORMATIVE EVALUATION. WHAT DO YOU THINK ABOUT THAT?

DESIGNER #2:

Hmm, I never thought about that. Formative evaluation meaning evaluating the product before it's done. That's an interesting thought.

*Q50: AND I GUESS THE ONE OF THE REASONS WHY THEY SAY THAT IS BECAUSE WITH FORMATIVE EVALUATION IT IS DONE BEFORE THE PRODUCT IS FINISHED AND YOU MAY OR MAY NOT HAVE MORE THAN ONE FORMATIVE EVALUATION.

DESIGNER #2:

Sure.

*Q51: THEN MY NEXT QUESTION IS IF YOU HAD TO IDENTIFY A PROJECT OR PROJECTS THAT WOULD BE GOOD FOR RAPID PROTOTYPING OR I SHOULD SAY TYPES OF PROJECTS, WHAT WOULD YOU SAY?

DESIGNER #2:

Umm, I think umm, probably the systems ones which you can do an on-line system and show them what it's going to look like. Lots of people still don't understand CBT. Umm, so that's a good one to show people what it is you're talking about to make sure they not only understand it but they you know it's a lot of time that goes into it. Umm, and the user's guide was a good one. The instructor's guide. Even an umm, a small half-hour portion of a class. Class is a little harder though because usually there's umm you know you're leading up to and working through on a class and how do prototype just part of a class?

*Q52: WELL, ARTHUR ANDERSEN DID THAT AND WHAT THEY DID UMM, THEY JUST THEY PROTOTYPED THE CLASS WITH ONLY PART OF THE MATERIALS. THE PART THEY DID THE PROTOTYPE OF. AND, UMM THEY GOT VERY GOOD REVIEWS ABOUT IT YOU KNOW AND THE CHANGES THAT THEY HAD TO MAKE WERE MINOR IT SEEMS LIKE.

DESIGNER #2:

It depends on what the class was on. A 2 hour spout just like the Parts Releasing was a 2 hour seminar. By the time I prototyped it you know prototyped one slide you know what are we getting at here. May be in a way we prototyped Parts Releasing because umm we did a pilot class okay and then came back with some revisions based on that pilot class. Umm, and now we're piloting we're suppose piloting again but essentially we piloting again. So the question is was that a prototype where we looked and saw what worked and what didn't work and now we're going out and actually you know doing a second pilot on it? So in a way yeah. Cause the changes weren't major but they were enough to say oh we're

throwing too much information at these engineers. We need to change the way the class works a little bit. Even now we're I'm glad it's a pilot cause I can see that I need a little more change from section to another.
*Q53: HOW MANY PILOTS HAVE YOU HAD FOR PARTS RELEASING?
DESIGNER #2:
Well we did the one pilot with way back in the summer. This last time now I guess Sarah had me in front of wow I think we did 4 or 5 classes at CTC. And now I'm going to do 4 at JTE. So what's that 9 classes. Now I don't know if that is one big huge pilot or if that's 9 pilots. Umm, I'm kinda looking at it as one big huge pilot and gathering all the data and then we'll make changes after we decide which changes we want to make. And that's real important too. You've gotta have umm for a prototype you've have to have the right people involved at the right to make. You know you've got to have the decision-makers in there. Cause if the decision-makers aren't in there and you've got someone who says change this it changes. And then the decision-maker sees it later. There's no reason to have the prototype in the first place.
*Q54: SO YOU'RE SAYING THE DECISION-MAKER COULD NOT BE A USER OR MAYBE NOT KNOW THE SYSTEM?
DESIGNER #2:
The decision-maker could it depends on who the client is. Okay? But one of your reviewers needs to be a decision-maker. If it's a change in the process you have to have someone whose a decision maker to say yeah we're going to change the process this way or you know. The decision-maker being someone in the company who is high enough up to say yeah that's the way this really works. Its not always just the subject matter expert. The subject matter expert is an expert on the subject but they may not be a decision-maker.
*Q55: SO HOW DO YOU KNOW? WHAT DO YOU DO WHEN THE DECISION-MAKER SAYS OKAY WE'RE DONE WE'RE NOT GOING TO CHANGE THIS ANY MORE AND THEN SOMEONE ELSE SAYS BUT WE NEED TO CHANGE THIS.
DESIGNER #2:
We go to the Emdicium Project Leader. (Laughter)
*Q56: GO TO THE PROJECT LEADER.
DESIGNER #2:
Go to the project leader. I don't know I think you really need to make sure that the person who's saying go ahead and make these changes is the person whose paying for it. Because if you go ahead and make changes that they didn't want and they don't want to pay for them. You have a problem.
*Q57: IS THERE ANYTHING ELSE YOU'D LIKE TO TELL ME.
DESIGNER #2:
Can't think of anything but I'll go look for those documents for you. Cause it'll probably help.

Transcript 002A

*Instrumentation for the Telephone Interview with Clients
*Open-ended interview Transcript for Customer #2
*Recorded Oct 7, 1997
*Customer #2 was a user representative
*Q1: WHAT WAS THE ACTUAL FINAL DELIVERABLE THAT YOU RECEIVED?
CUSTOMER #2:
Umm, I'm not sure umm, I understand the question.
*Q2: OKAY, THE PRODUCT THAT EMDICIUM PRODUCED FOR YOU ON GPLUS.
Well, they did several things, okay? Umm, they did on-line help in the system,
TONI:
OKAY.
CUSTOMER #2:
They did an umm on-line tutorial in the system, umm they did several umm workbooks I guess you would call them, they did a user's guide they did a teacher's guide. I'm not sure if teacher's was the right word. But something similar to that. And umm well that's about it basically.
*Q3: OKAY THAT'S WHAT I NEEDED TO KNOW.
CUSTOMER #2:
Okay.
*Q4: AND DID THEY TALK TO YOU ABOUT THE RAPID PROTOTYPING PROCESS?
CUSTOMER #2:
Umm, to a certain extent. A very little bit you know.
*Q5: OKAY, COULD YOU JUST GIVE ME LITTLE BIT OF AN IDEA OF WHAT YOU KNOW ABOUT IT BASED ON WHAT THEY EXPLAINED TO YOU.
CUSTOMER #2:
Just basically that it was a method of being able to turn things around quickly, to be able to adjust to you know to making umm changes within the system to the various things we just talked about the help and the guide and things like that. And more of an involvement up front of us the customer if you will umm in looking at the things as they were going along.
*Q6: OK, GREAT. WHAT I'M GOING TO DO NOW IS TO READ SOME STATEMENTS TO YOU. I ACTUALLY HAVE ABOUT 7 OR 8 OF THEM. AND I WILL ASK YOU TO TELL ME WHETHER YOU AGREE OR DISAGREE AND THEN EXPLAIN YOU ANSWER.
CUSTOMER #2:
Okay.
*Q7: RAPID PROTOTYPING HELPS (TO) PRODUCE QUALITY INSTRUCTIONAL MATERIALS.
CUSTOMER #2:
Agree *X*_

Well, I mean I'm going by the basis of you know my experience with the information the things I got from Emdicium they were definitely high quality you know. And I would think that this process was a big part of that.
*Q8: RAPID PROTOTYPING PRODUCES THE FINAL PRODUCT IN LESS TIME THAN OTHER INSTRUCTIONAL DEVELOPMENT MODELS.
CUSTOMER #2:
I can't answer that. I have no experience you know with other models.
*Q9: RAPID PROTOTYPING INCREASES CUSTOMER SATISFACTION BECAUSE THE PRODUCT IS PRODUCED QUICKER AND WITHIN THE FINANCIAL AND TIME CONSTRAINTS.
Agree *x*_
CUSTOMER #2:
I would say probably correct, you know, based on again my experience with it. Definitely and the umm time constraints were held very well by Emdicium. They stayed very well within you know the time constraints.
*Q10: AS FAR AS THE BUDGET. WAS THE PROJECT COMPLETED WITHIN THE BUDGET THAT WAS ALLOCATED?
CUSTOMER #2:
I don't have experience with the, you know, the dollars and stuff myself but I would believe that they are. I'm sure that there was a contract written you know. With the project leader prior to the project and I doubt very much that there was much change to that. You know there could have been some but I'm not too experienced the exact amounts or dollars and things.
*Q11: RAPID PROTOTYPING REDUCES CYCLE TIME AND IN OUR CASE WE MEAN THE TIME FROM THE KICKOFF MEETING TO THE TIME WHEN THE TUTORIALS AND THE WORKBOOKS WERE ACTUALLY DELIVERED TO YOU. SO RAPID PROTOTYPING REDUCES CYCLE TIME SINCE A SMALL PORTION OF THE FINAL PRODUCT IS REPRESENTED BY THE PROTOTYPE AND THAT REPRESENTS A GREAT DEAL OF THE FINAL PRODUCT. WAS THE PROTOTYPE A PRETTY GOOD LIKENESS OF THE FINISHED PRODUCT AND DO YOU THINK THAT HELPED YOU TO GET THE PROJECT DONE QUICKER.
CUSTOMER #2:
Agree *x*_
Umm I would say definitely the prototype was very similar to the final project. Now as far as if that umm makes it quicker or not my guess would be yes. Once again I'll go back to say that I don't have experience with other methods but I would certainly think (pause) it seems to me like it would be a quicker way of doing it.
*Q12: AND WHEN THE PROTOTYPE WAS PRESENTED TO YOU UHN WHERE THERE SUBJECT MATTER EXPERTS AND ACTUAL USERS UMM END-USERS THAT REVIEWED THE PROTOTYPE?
CUSTOMER #2:
Yes, definitely.
*Q13: CUSTOMER INPUT IS A MAJOR COMPONENT OF THE RAPID PROTOTYPING PROCESS. THE PROTOTYPE SHOULD BE REVIEWED AND REVISED BASED ON THE CUSTOMER'S FEEDBACK. THIS

FEEDBACK MINIMIZES REVISIONS IN THE PRODUCT DURING THE PILOT STAGE. WHEN YOU ACTUALLY WENT THROUGH A PILOT WITH THE WORKBOOK AND TUTORIALS, HOW DID THAT GO?
CUSTOMER #2:
Agree *x* Disagree ___ Please explain.
That went real well. And it did it was definitely minor changes that needed to be made nothing major.
*Q14: RAPID PROTOTYPING HELPS TO PRODUCE A PRODUCT THAT IS IMMEDIATELY USABLE TO THE END USER.
CUSTOMER #2:
Agree *X*_
I would say yes, I would probably agree with that.
*Q15: OKAY SO ONCE THEY GAVE YOU WHAT WAS CONSIDERED THE FINISHED PRODUCT, YOU WERE ACTUALLY ABLE TO GO ONLINE AND USE THE HELP, USE THE TUTORIAL, THEY BEGAN TO CONDUCT THE ACTUAL CLASSES AND WHAT HAVE YOU?
CUSTOMER #2:
Yes.
*Q16: NOW HAVE YOU WORKED ON OTHER PROJECTS THAT HAD PRODUCTS LIKE A TUTORIAL, AND THE INSTRUCTOR'S AND PARTICIPANT'S GUIDES THAT WERE SIMILAR TO GPLUS?
CUSTOMER #2:
No. I did not.
*Q17: AND WHAT WAS YOUR ROLE ON THIS PARTICULAR PROJECT?
CUSTOMER #2:
Well I'm sorry Toni, lets go back on that one. I worked on other projects but they did not have exactly similar type of tutorials and participants guide and user's guides. Umm I worked on another project that had on-line help and also you know it did have some type of user's guide or self-instruction guide I should say that. I'm sorry THAT'S OKAY. It wasn't exactly the same.
*Q18: RIGHT, OKAY NOW WITH THAT OTHER PROJECT DID YOU UMM WORK WITH A PROTOTYPE AT THAT POINT? DID THEY HAVE A PROTOTYPE?
CUSTOMER #2:
Umm, no they did not.
*Q19: OKAY, HOW WOULD YOU COMPARE THE GPLUS PROJECT WITH THE OTHER PROJECT?
CUSTOMER #2:
Umm you know the prototyping was definitely the better way to go.
*Q20: OK AND YOUR ROLE ON THE PROJECT WAS?
CUSTOMER #2:
I was a user representative for a particular you know area of the company. It was an internally you know internally created umm system within the company and I was a representative of one of the major groups that would be using the system.
**Q21: IS THERE ANYTHING ELSE YOU CAN TELL ME ABOUT THE GPLUS PROJECT?
CUSTOMER #2:

Umm not that I can think of. Not that would shed any light on.
*Q22: COME TO THINK OF IT I DO HAVE ANOTHER QUESTION. HOW MANY PEOPLE WERE ON THE REVIEW TEAM THAT YOU HAD WITH THE PROTOTYPE?
CUSTOMER #2:
Umm. It varied you know. As far as the user representatives there were at time lets see one two (pause) I'd say from as high as six from down to as low as about three or four.
*Q23: GREAT. AND THE ON-LINE HELP, THE TUTORIALAND THE GPLUS CLASSES ARE STILL BEING CONDUCTED NOW.
CUSTOMER #2:
Umm I'm not sure about the on-line tutorial. Umm on line help definitely, classes definitely. Umm I don't think they continued with the on-line tutorial. I think they discontinued that.
TONI:
OKAY. GREAT. WELL YOU HAVE BEEN A GREAT ASSISTANCE FOR ME IN TERMS OF GETTING THIS DONE. I REALLY APPRECIATE YOUR HELP.
CUSTOMER #2:
No problem.
TONI:
AND WHEN I'M DONE I'LL BE SURE TO GET A COPY OF THE STUDY TO YOU.
CUSTOMER #2:
Okay, very good.
TONI:
THANKS A LOT, BYE
CUSTOMER #2:
Bye.

Transcript 003

*Instrumentation for the Telephone Interview with Emdicium Employees
*Interview Transcript for Designer #3
October 28, 1997
*Q1: WHAT I'M GOING TO DO IS FIRST I'M GOING TO GO THROUGH YOUR SURVEY WHERE I MARKED IT UP AND HAD QUESTIONS FOR YOU. AND THEN I'LL ASK YOU THOSE QUESTIONS OFF OF THERE AND THEN I HAVE ANOTHER LIST OF QUESTIONS THAT IF I HAVEN'T ALREADY ASKED YOU I'LL ASK FROM THAT. I WILL START WITH PAGE 2. I ASKED YOU IN MY NOTE HERE WHO WAS THE SUBJECT MATTER EXPERT BUT IT REALLY ISN'T THAT IMPORTANT.
DESIGNER #3:
It'll come back to me in the middle of the night. You'll get an email with a name.
*Q2: OKAY. ALSO ON PAGE 2 UNDER TASK DONE IN PARALLEL FOR IDENTIFY CONTENT, UMM YOU SAID ON A SINGLE TOPIC NO OTHER TASK WERE PERFORMED CONCURRENTLY, HOWEVER I NORMALLY DEVELOP SEVERAL TOPICS AT A TIME. I'M WONDERING HOW MANY TOPICS DID YOU ACTUALLY WORK ON.
DESIGNER #3:
On average probably 3.
*Q3: THREE, OKAY. WERE YOU ABLE TO SIMULTANEOUSLY FINISH DEVELOPMENT FOR EACH TOPIC AT THE SAME TIME?
DESIGNER #3:
Well like I said each one was in a different stage. I might be doing research on one and writing on another programming on another one. That's the way I liked it to be although in some cases I did the writing on two sort of simultaneously. Since they were part of the same project they didn't interfere with one another. I usually can't write on 2 different topics at the same time. My mind isn't wired that way. I can do them in the other direction. That frustrates Bob (name changed for anonymity purposes) it took him so long to understand that about me. That it wasn't not willing to do, it was can't do. Can't do it. It hurts, you know.
(Laughter)
*Q4 OKAY. WHAT WERE THE OTHER 3 TOPICS? CAN YOU JUST GIVE AN EXAMPLE OF THEM?
DESIGNER #3:
I'm trying to think of 3 I might have been working on simultaneously. I'm trying to remember the names of the topics. I know that I did team structure and early sourcing. I was when I was working on this one I was working on early sourcing, team structure was done that was in the first release. And umm, program parts list and program direction.
*Q5: SO YOU SAID TEAM
DESIGNER #3:
Umm, no, umm early sourcing, program parts list, engineering sign off. I'd said those three. That's probably a good bet those three were together.
*Q6: ON PAGE 3 FOR WRITE DESIGN CONCEPT MEMO, YOU SAID YOU WERE NOT INVOLVED IN WRITING THE OVERALL DESIGN CONCEPT

HOWEVER YOU DID WRITE A DESIGN MEMO FOR EACH TOPIC. WHAT TYPE OF CONTENT WAS IN THAT DESIGN MEMO OTHER THAN THE HIGH LEVEL CONTENT OUTLINE?
DESIGNER #3:
Umm, just a description of the treatment which probably said it would consist of one overview module and 4 detailed modules and that kind of thing for treatment. The most important part of that design memo was the high level content outline which was the structure. We were trying to get approval of the structure before we got to the prototype.
*Q7: NOTHING IN THERE ABOUT THE HYPERLINKS THAT WENT ALONG WITH THE HYPERMEDIA?
DESIGNER #3:
No we weren't at that level of detail. It was really going to be that was really how many modules, is this the way you want to take this topic and power it up.
*Q8: OKAY. WHO REVIEWED AND GAVE YOU THE APPROVAL? WAS IT A SUBJECT MATTER EXPERT?
DESIGNER #3:
The subject matter expert whose name I have not yet remembered.
*Q9: DO YOU KNOW IF THAT SUBJECT MATTER EXPERT WAS AN ENGINEER OR A MANAGER?
DESIGNER #3:
He was a manger. I don't whether his background was in engineering. But he was a manger.
*Q10: FURTHER DOWN ON PAGE 3 – TASKS DONE IN PARALLEL. CONCURRENTLY WITH DEVELOPING THE ON LINE STRUCTURE I PROVIDED GO BYS. I'M NOT SURE WHAT A GO BY IS.
DESIGNER #3:
A go by...actually a go by is a reference. And so I said my sketches. These were my sketches that I gave to Bob Mirek so that he could do real are. Like I would do my stick figures because I can't draw anything and he would come back with nice looking sketches. So go bys was something for him to go by to do the pictures.
*Q11: SO AND I THINK YOU MIGHT HAVE ANSWERED THIS ALREADY BUT I MISUNDERSTOOD. I WAS WONDERING HOW LONG IT TOOK TO WRITE THE MEMO AND GET APPROVAL
DESIGNER #3:
I said two days. When I at that I say two days. It probably took me you know the better part of a day to write it and probably got approval on a different day. Actually, I probably got the approval itself in less than a day. But it was like a day for me to write it and a day for the subject matter expert to review it, get it back to meand get the meetings scheduled that were to follow.
*Q12: FURTHER DOWN UNDER IDENTIFY CONTENT FOR THE PROTOTYPE THE LAST SENTENCE IN THE FIRST PARAGRAPH...FOR OTHER HYPERMEDIA TOPICS APPROVAL OF DESIGN MEMO LAUNCHED SCHEDULING OF MORE IN-DEPTH RESEARCH. WHY WAS THAT?
DESIGNER #3:

Sometimes there was more than one subject matter expert than the person that I was umm meeting with initially to get the initial structure worked done. Then gave me the names of the engineers. If we had to actually go into the engineering community then either the subject matter expert didn't know all of the content or there was more than one person responsible for the content. Also umm if that particular subject matter expert was the person whose name then she or he wasn't particularly prepared to do that then they delegated. We had to go out and chase them.

*Q13: DOWN ON BUILD THE PROTOTYPE – WHILE I DEVELOPED THE ONLINE PROTOTYPE A GRAPHIC ARTIST DEVELOPED PENCIL SKETCHES OF THE ILLUSTRATION. DID YOU DO SOME KIND OF STORYBOARD PRESENTATION OR SOMETHING?

DESIGNER #3:

That was part actually the prototype was an online storyboard but it didn't include any pictures. It included descriptions of pictures and so this is what the graphic artists developed from my go bys up here...develop nice looking picture. (She drew a sketch) actually the paper looked like this. You have your old fashioned go by paper where you have your sketch here and then you get your little picture here. Then you write your video script from this. That kind of a thing. Then as we stepped through the prototype on line there was a description of the pictures and that what it looked like.

*Q14: THEN PAGE 4 – REVIEW THE PROTOTYPE WITH CUSTOMER, REVISE AS NEEDED. MY QUESTION IS THAT YOU SAID IT WAS FORMALLY PRESENTED ONLINE TO THE SUBJECT MATTER EXPERT... WERE THERE ANY END-USERS THAT REVIEWED THE PROTOTYPE?

DESIGNER #3:

Never in my experience.

*Q15: DO YOU KNOW WHY THAT IS?

DESIGNER #3:

Umm it was never in the initial umm plan to do it that way and I think that might have you know Bob (name changed for anonymity purposes) would be the one you'd need to answer that questions. But it was probably just at two high a level. You'd have an end user there looking at a blank box saying whether that describes thus and so. I'm not sure an end user would have known what to do.

*Q16: DO YOU KNOW IF THE SUBJECT MATTER EXPERT HAPPENED TO HAVE BEEN AN END USER?

DESIGNER #3:

That subject matter expert wasn't. I really don't think any of the SMEs where except in the cases where we really had to get down in to engineering communities to get the information. Actually technically they were all end-users because it was designed for management. It was designed for engineering. It was designed for finance. So technically they were an end user but from a training stand point they probably weren't. So you could look at them from that viewpoint as an end user.

*Q17: SO THE AUDIENCE FOR THE HYPERMEDIA WAS BASICALLY ANYBODY AT ORGANIZATION #2 IN THE PRODUCT DEVELOPMENT PROCESS? SO THAT INCLUDED ENGINEERS, MANAGERS, DESIGNERS.

ANY OTHER PEOPLE? I CAN'T THINK OF WHAT OTHER KIND OF PEOPLE THERE WOULD BE?
DESIGNER #3:
The whole idea was that they would be able to find information on their own responsibilities and just also be able to see how if affected other groups. It's a simple world class timing overview. But with the hypermedia they could choose to look at what other folks were doing.
*Q18: NEXT, GET AGREEMENT REGARDING THE PROTOTYPE AND FREEZE THE CONTENT. WAS THE CONTENT EVER ACTUALLY FROZEN?
DESIGNER #3:
In the case of engineering signoff yes it was.
*Q19: DO YOU KNOW ABOUT IT FOR THE OTHER MODULES?
DESIGNER #3:
Umm, I would say probably more than half the cases
*Q20: MORE THAN HALF THE CASES, NO THE CONTENT WAS NOT FROZEN?
DESIGNER #3:
No it was not frozen and I believe the reason why is there well there a lot of reasons. If you had more than one subject matter expert, sometimes they didn't agree with each other. If you had a subject matter expert who was told you're going to be responsible for this and they either weren't prepared or didn't want to or something like that. You had to go out and chase the information and sometimes you chased it right through to the pilot. So it would keep changing and changing and changing. Engineering signoff was really an ideal world that's why I picked that one. That was one that I know that the Emdicium principals held up to Organization #2 and said this is an example of how quickly you can get it done when things go well. When Organization #2 is prepared and it goes according to the plan.
*Q20: SO ENGINEERING SIGNOFF WAS THE BEST OF RAPID PROTOTYPING SO TO SPEAK.
DESIGNER #3:
Yeah and yes it was frozen. It didn't change after that. You know it was a missing period here and a typo there and you know we'll do something with that picture and just such minor tweaks. It was really a joy. I wish they'd all be like that.
*Q21: OKAY. LET'S SEE...WRITE THE REMAINING COMPONENTS. THERE ARE NO REMAINING COMPONENTS IN THE WORLD CLASS TIMING ASSIGNMENT. MEANING FOR THE ENGINEERING SIGNOFF TOPIC?
DESIGNER #3:
For any of... well there were two things I guess you could call remaining components. There were glossary terms that needed to be added to the overall glossary for hypermedia. And there was a one page actually it was more than one page but it was overall page summary with I think four different categories of stuff that it linked to. So it was really a five page umm hypermedia summary that went in the introductory module. Those were the two adjunct things and that was true

for all of the modules. There was no print piece or anything else that went out that I know of or that I had to do.
*Q22: OKAY. YOU DID SAY HOWEVER I DID HAVE TO WRITE FULL FIRST AND SECOND DRAFTS. THIS WAS FOR THE ENGINEERING SIGNOFF AS WELL AS ALL THE OTHER TOPICS?
DESIGNER #3:
The plan was to do the prototype, which defined all of the boxes, described what was going to be in it and all of the pop up boxes and detail screens. Umm the prototype included all of the high level text. All of the high level narrative but not what would come up in a pop up box and if you want to consider the prototype first draft then the second draft would be to actually add the pictures in, fill in the detail in all of the pop up boxes and detail screens and the third draft was make it in that review.
*Q23: I WANTED TO ASK YOU ABOUT THE DRAFTS THAT YOU SPOKE ABOUT. WOULD THE DRAFTS BE...LET ME BACK UP; WAS THERE AN ALPHA AND A BETA OF THE PROTOTYPE? AND WHERE DO THE DRAFTS FIT IN?
DESIGNER #3:
Umm, I would have called the prototype in my mind when it was structured; the prototype was the first draft. And there would only have been a beta or a second issue of the prototype if the first prototype had been changed for some reason. I can't remember ever presenting a prototype twice. So, no, there wasn't an alpha and a beta because the umm in the prototype phase, treating the prototype as a deliverable it was the structure. Once the structure was built and it was approved it was done. And then we went into a second draft or first draft however you want to call that and added the detail to it. The structure was already there so maybe umm the next draft would have been beta and the final draft would have been released. That was the ideal. The final draft would have been pilot.
*Q25: FOR PAGE 5 – PILOT TEST THE PILOT. WORLD CLASS TIMING PILOTS WERE A RELEASE STEP. DOES RELEASE MEAN THAT IT WAS MADE AVAILABLE TO THE USERS?
DESIGNER #3:
Umm, no. The modules weren't issued one at a time. You know, and there were a lot of other people besides me working on different modules. Unless we got 3 or 4 done they were put together in a release to the end-users.
*Q26: YOU MEAN AS SOME TYPE OF SOFTWARE PACKAGE?
DESIGNER #3:
It's like a software version. Here's your new software package. The first release I think included 4 modules. And I did 2 of them. And umm Gloria (name changed for anonymity purposes) did one and I think Designer #2 did one. So the first release consisted of 4 modules and they were brought together and linked under the overall module, which Bob (name changed for anonymity purposes) wrote and linked together. And piloted as a unit.
*Q27: WAS THAT UNIT THEN AVAILABLE TO THE USERS?
DESIGNER #3:

Then that unit was delivered to the users or distributed umm sometimes via diskette and sometimes via Organization #2's network. The pilot you know it was a pilot of the release not a pilot of the individual modules.
*Q28: BECAUSE THE RELEASE CONSISTED OF SEVERAL MODULES?
DESIGNER #3:
Right. And then as releases went on like I said in my note to myself here I said release one had 4 modules. Release 2 had 7 and that 7 included the original 4 plus 3 news ones, which were linked into the original 4and with each other. It just kept growing as a structure.
*Q29: DO YOU KNOW HOW FEEDBACK WAS OBTAINED ON THE PILOT?
DESIGNER #3:
We had a feedback I believe we had a feedback form or feedback item that they could they the pilot participants could select on the screen. Yeah we did, they could right their notes and one of the things we had to do then was retrieve feedback off of all of the machines.
*Q30: WERE REVISIONS MADE BASED ON THAT FEEDBACK?
DESIGNER #3:
Yes, absolutely. And also we had visual feedback because we had a room full of people. Umm some of them were the SMEs. We walked up and talked to the people, watched what they were doing, where there to answer their questions.
*Q31: SO IT WAS A PILOT TEST SESSION, SO TO SPEAK?
DESIGNER #3:
Session, yeah. People were invited to attend. So we got to watch them too
*Q32: DO YOU KNOW HOW THEY SELECTED THE PEOPLE THAT ATTENDED?
DESIGNER #3:
I think each subject matter expert identified individual people. That would be a good question for Bob (name changed for anonymity purposes). As I recall each subject matter expert was responsible that was some of the SMEs weren't happy about being SMEs. Because they were given these responsibilities like now you have to have 8 people show up. So then the subject matter expert would have to go around and look for people. And basically if they had power to dictate they show up or beg and plead and you know however they wanted to do it. (Pause) how many topics in total?
*Q33: RIGHT. DO YOU KNOW?
DESIGNER #3:
Fifteen – 17. I know we had 15 out there and I know that I believe that there were 17 developed. But I don't think we ever had that final release. I know that I developed one umm module that was never released because we didn't do never had that final umm release because Organization #2 didn't approve...there were modules that were supposed to be developed but they just it never went forward. There was one hanging out there.
*Q34: DO YOU KNOW WHY THEY DECIDED TO NOT RELEASE SOME OF THEM?
DESIGNER #3:

I think Project #2 was winding down. Umm, it had been out there for quite a while you know for like 5 years. Umm, they couldn't add to it indefinitely. They had in the middle of world class timing undergone the Organization #2 2000 metamorphosis and rearranged all their groups. And the thing that was in question was well, are we going to re-do all of the hypermedia from the Organization #2 2000 standpoint. And I remember doing some demos and prototypes of how that worked and all that. And Bob (name changed for anonymity purposes) did a paper on changing the interface to bring it up to look more like windows because windows had changed in the interim. It just it was like other like Organization #2's concept to customer and some of the other things I worked on in other lives. They rolled and metamorpohasized it to something else.

*Q35: NOW ONE OF YOUR STATEMENTS HERE SAYS DEVELOPMENT OF THE ENTIRE ENGINEERING SIGNOFF – THIS IS ON THE BOTTOM OF PAGE 4 – TOOK ABOUT 7 WEEKS, EVERYTHING WAS AS PLANNED. SO THE ORIGINAL PLAN WAS THAT YOU WOULD ONLY TAKE ABOUT 7 WEEKS TO COMPLETE THIS?

DESIGNER #3:

This came in way under on time. It came in way under on time.

*Q36: WHEN WAS IT ORIGINALLY ESTIMATED TO BE DONE?

DESIGNER #3:

I don't remember when it was estimated to be done. But most modules took umm 3 months. And this thing took less that 2 months to do but it just breezed through. But its because the client was prepared, the information was all in one place, it was all documented. I didn't have to chase it.

*Q37: WAS THERE OR DO YOU KNOW IF THERE WAS A PROTOTYPE FOR EVERY TOPIC?

DESIGNER #3:

Yes. There was a prototype for every topic that I did. And because it was part of the plan I don't think that Bob (name changed for anonymity purposes) would have let anything go un-prototyped.

*Q38: AND WE FINISHED THE PROJECT – YOU MAY NOT KNOW THIS EITHER – WITHIN THE PROPOSED COMPLETION TIME THAT WE HAD ORIGINALLY PROPOSED TO THEM?

DESIGNER #3:

I believe that this was a rare project where we were being paid on time and materials and it went on as long as it went on. Again, Bob (name changed for anonymity purposes) would know whether there was ever a completion time proposed because see he put together the whole original overall design for the project. Then you're asking him to think back a good long way too. Like to 1992.

*Q39: I'M NOT GOING TO ASK YOU ANYTHING ABOUT FTEP. THE REASON BEING THAT YOU AND ONE OF THE EMDICIUM PRINCIPALSBOTH AGREE AND I AGREE WITH YOU TOO THAT FTEP WAS NOT AN EXAMPLE OF RAPID PROTOTYPING. AS A MATTER OF FACT WHEN I SPOKE WITH THE CLIENT AND INTERVIEWED ONE OF THE CLIENTS ON THE PROJECT IT WAS CLEARLY OBVIOUS TO ME SHE DIDN'T KNOW WHAT A PROTOTYPE – WHAT RAPID PROTOTYPING WAS. AND I KEPT THINKING THIS WAS A RAPID

PROTOTYPING WHY DOESN'T SHE KNOW. BECAUSE IT REALLY WASN'T. SO WE'RE NOT GOING TO USE THAT. YOUR FINAL COMMENTS WERE FINE. NO QUESTIONS ON THOSE. YOU MIGHT HAVE ANSWERED THIS ALREADY – HOW CLOSELY DID THE FINAL PRODUCT RESEMBLE THE PROTOTYPE?
DESIGNER #3:
Very closely.
*Q40: WHAT TYPES OF CHANGES DID YOU HAVE TO MAKE?
DESIGNER #3:
Really no changes, I just filled in the boxes. Sometimes I added a box here or there.
*Q41: SO THE OVERALL STRUCTURE STAYED THE SAME? YOU JUST ADDED IN MORE CONTENT?
DESIGNER #3:
Right.
*Q42: NOW THAT YOU'VE USED RAPID PROTOTYPING WHAT'S YOUR FEELING ABOUT IT?
DESIGNER #3:
I love it!
*Q43: TELL ME WHY.
DESIGNER #3:
But backing up before tell me why, umm, I have a problem or dilemma with the definition of rapid prototyping. I think what I need is a definition. When I say rapid prototyping I'm talking about online.
*Q44: YOU'RE TALKING ABOUT AN ONLINE PROTOTYPE. A PROTOTYPE OF A PIECE OF SOFTWARE?
DESIGNER #3:
A working model of a piece of software which is very much easier to put in front of somebody whether they're an end user or subject matter expert. Say click your way through it and tell me what you know about the look and feel and how do you think it works. It's a little bit harder to do with print. Although you can do it with print.
*Q45: WHAT PROBLEMS HAVE YOU HAD WHEN USING IT WITH PRINT?
DESIGNER #3:
Umm, because there's really not much to click through. And where do you...umm, well, okay, lets back up further. I think the software has developed remember WordPerfect on the blue screen where it wasn't WYSIWYG and what you saw wasn't what you got? Umm, I think that prototyping was kind of a normal evolution of software getting better in terms of print. Because I can remember way back doing things on typewriters and the early word processors where word processing systems where you did a manuscript draft. It was double spaced and then you handed it over to somebody either for retyping or reformatting or keylining where they would actually umm, retype it in the shiny paper and cut it out and paste it down. You know the old fashion stuff. So I think prototyping kind of came along naturally and normally when software got better I think for people who were willing to learn some of the concepts of layout. And that was very good.

But I remember some of the people who had no clue what a font was and other things. It was very hard because they all of sudden had to learn the discipline that the artist use to do. But I think we've gotten beyond that to the point where we're use to that. Now when you start typing you learn what a font is, you learn what all of these concepts. You don't have to learn them in catch up so that every time we open up Word and we type a document we are really doing a prototype if you compare it to what we use to do.

*Q46: OKAY PROTOTYPING IN THE SENSE THAT

DESIGNER #3:

What you see is what you get. You're actually creating the look and feel as well as the content of what you're doing. So prototype as look and feel has just been a normal evolution. It wasn't that I think people said that I'm going to go from manuscript development to a prototype. I think the software took us there in terms of print. So I find it hard to define a print product just look and feel in and of itself as a prototype because I don't think it was you know it evolved it wasn't a chosen task. I think a print prototype would be where you put together a little piece of a participant's guide, a little piece of instructor's guide, job aid and kind of talk/teach your way through it. That would be a prototype.

*Q47: AND THAT HAS BEEN DONE ON OTHER PROJECTS LIKE GPLUS.

DESIGNER #3:

Yeah, okay. We were going to do that on TRW but we didn't end up doing that and so what we ended up presenting to the client was more so here's what our templates look like.

*Q48: SO THE THINK IT SOUNDS LIKE IF I'M UNDERSTANDING YOU CORRECT IS THAT YOU EITHER HAVE A TEMPLATE OR YOU HAVE A PROTOTYPE. THE TEMPLATE BEING THIS IS THE PAGE LAYOUT OF HOW THE BOOK IS GOING TO LOOK. THE PROTOTYPE

DESIGNER #3:

A working model

*Q48 (CONT'D). BEING THIS IS HOW THE BOOK LOOKS WITH CONTENT IN IT.

DESIGNER #3:

No, even more than that this is how the instructor's guide looks with the section of content in it. Here's the corresponding participant's guide. Here's the corresponding job aid. Here's the corresponding slide. So that you could actually talk/teach your way through 30 seconds of instruction. It's to me the prototype has to be a working model. That's the definition that works for me.

*Q49: AND THAT IS THE DEFINITION OF IT.

DESIGNER #3:

So if the prototype is a working model then does it have to be a deliverable? That's the other part of the definition that I need to have that. Does the prototype have to be presented as a prototype as a deliverable so that it will do what it did in world class timing which was until the prototype is approved everything stops. The prototype as it was in world class timing was full structure so does prototype need to also include full structure and it will be modeled part of it.

*Q50: (WE WERE BOTH SPEAKING SIMULTANEOUSLY)...HOW WOULD YOU SEE THAT IN PAPER IN TERMS OF STRUCTURE.

DESIGNER #3:
An outline
*Q51: OKAY. SO IF THE PROTOTYPE IS A PAPER PROTOTYPE AND IT HAS THOSE OUTLINES OF EACH DELIVERABLE – IT HAS THE PAGE LAYOUT, THE PACKAGING, ETC. IT IS A PROTOTYPE.
DESIGNER #3:
Yeah.

Transcript 003A

*Instrumentation for the Telephone Interview with Clients
*Open-ended Interview Transcript for Customer #3 recorded
*Sept. 30, 1997 7:00p – 7:39
*Customer #3 was a consultant on the project.
*Q1: WHAT WAS THE DELIVERABLE FOR THE PROJECT THAT YOU WERE ON WITH EMDICIUM?
CUSTOMER #3:
It was a hypermedia course/program that described the product development process at Organization #2.
*Q2: OKAY. AND IT WAS USED BY WHAT TYPE OF PEOPLE AT ORGANIZATION #2?
CUSTOMER #3:
Engineers and others who were connected with the product development process.
*Q3: DID ANYONE EXPLAIN TO YOU THE RAPID PROTOTYPING PROCESS?
Umm, Toni, umm, I left before they got to that. Before they described that process.
TONI:
OH. OKAY.
CUSTOMER #3:
But I have a general umm familiarity with the prototype process.
TONI:
OK.
CUSTOMER #3:
But you know my umm input may not be worthwhile now. But if you'd like to go ahead I'll try.
TONI:
OK. WELL, LET'S GO AHEAD A LITTLE BIT. I'LL, YOU KNOW, I'LL READ THE STATEMENTS TO YOU AND WE'LL SEE, YOU KNOW, WHETHER OR NOT YOU'LL BE ABLE TO UHN TO GIVE ME SOME INFORMATION THAT WILL BE USEFUL AS FAR AS PROTOTYPING IS CONCERNED CAUSE I DIDN'T REALIZE THAT YOU WEREN'T IN IT AT THAT POINT. OK?
*Q4: RAPID PROTOTYPING HELPS TO PRODUCE QUALITY INSTRUCTIONAL MATERIALS.
CUSTOMER #3:
Agree *X*_
OK, I'll agree in that that anything that saves time umm does not reduce the quality of the product. It's a benefit.
TONI:
SO YOU BELIEVE THAT THE PROTOTYPE HELPED TO REDUCE THE TIME UMM AND PRODUCE THE QUALITY MATERIALS.
CUSTOMER #3:
No response.

*Q5: RAPID PROTOTYPING PRODUCES THE FINAL PRODUCT IN LESS TIME THAN OTHER INSTRUCTIONAL DEVELOPMENT MODELS.
CUSTOMER #3:
Agree *x*_
CUSTOMER #3:
Umm, I probably agree but I'm not an expert in instructional design.
TONI:
OK but if you when you worked. I guess you hadn't worked on a similar project when you worked on a similar project with another client cause this was a first right?
CUSTOMER #3:
This was a first and it was the first time. Umm, I had been in a line organization before so I was not in any kind of instructional design activity or training activity before.
TONI:
OK I understand I have one other statement.
*Q6: RAPID PROTOTYPING INCREASES CUSTOMER SATISFACTION [BECAUSE THE PRODUCT IS PRODUCED QUICKER AND WITHIN THE FINANCIAL AND TIME CONSTRAINTS]. [DID NOT INCLUDE THIS IN THE STATEMENT READ TO ED]
CUSTOMER #3:
Agree *x*_
Well it could umm if the product was attractive to the customer. Then it would increase customer satisfaction because it, the product, would arrive earlier.
*Q7: WERE YOU THERE WHEN THE ACTUAL HYPERMEDIA WAS DELIVERED?
CUSTOMER #3:
Yeah.
*Q8: OK. AND WERE YOU SATISFIED WITH IT?
CUSTOMER #3:
Umm, I didn't really know much about it but as I umm as I became more familiar with it, it became satisfactory to me because now I was learning about this new process and umm
TONI:
Meaning learning about the hypermedia process?
CUSTOMER #3:
Yes, the hypermedia process.
TONI:
OK that makes sense.
*Q8: RAPID PROTOTYPING REDUCES CYCLE TIME SINCE A SMALL PORTION OF THE FINISHED PRODUCT REPRESENTS A GREAT DEAL OF THE FINISHED PRODUCT.
CUSTOMER #3:
I DON'T UNDERSTAND. MAYBE COULD YOU EXPLAIN A LITTLE BIT MORE ABOUT WHAT?
TONI:

SURE. WE VIEW CYCLE TIME AS UMM THE TIME FROM THE KICKOFF MEETING TO THE TIME THAT THE PRODUCT IS DELIVERED. AND THE THINKING IS THAT THE PROTOTYPE REPRESENTS A SMALL PORTION. SO SAY THAT THE PROTOTYPE OF THE HYPERMEDIA REPRESENTED A SMALL PORTION OF WHAT THE FINAL HYPERMEDIA WAS TO LOOK LIKE. AND THE THOUGHT IS THAT BY HAVING THAT PROTOTYPE IT REDUCES THE TIME FROM KICKOFF TO DELIVERY BECAUSE YOU'VE ALREADY SEEN UP FRONT WHAT THE END RESULT WILL BE.

CUSTOMER #3:

I guess I would generally agree with that. Again you don't have to you know exclude this from the statement you include in your study. But I have been sort of amusing myself sort of working with umm the problem of information transfer from one individual to another. Or how to umm the processing of information and umm the prototype I would view its primary purpose as it primarily is information even though in a physical product it looks like a final car. And the information it conveys is that it umm proves that the process was done properly. OK and in that sense it would umm chances are reduce the cycle time because if it if that test isn't made if the prototype is you know is viewed as a test of the process if that test isn't successfully completed umm or lets say that if you if the whole design process was set up to make sure that you had a proper prototype. If that's not done there would from past experience you could I believe you its possible to say that umm if you didn't make that test, perform that test it would almost certainly take longer because umm I think that concentrates the planning that goes into this. So that they know that they're going to have to demonstrate a complete job in the prototype. And then if that's carried out successfully then of course it would shorten the cycle time.

TONI:

OK. Great. That was a great answer.

*Q9: CUSTOMER INPUT IS A MAJOR COMPONENT OF THE RAPID PROTOTYPING PROCESS. THE PROTOTYPE SHOULD BE REVIEWED AND REVISED BASED ON THE CUSTOMER'S FEEDBACK. THIS FEEDBACK MINIMIZES REVISIONS IN THE PRODUCT DURING THE PILOT STAGE.

CUSTOMER #3:

I have a little problem with that. Cause. Now I'm talking about the physical prototype, the umm prototype of the car or actual product that the customer receives. The prototype should be a confirmation of the engineering process. Engineering and manufacturing process. Okay and now umm the customer input should have taken place...quality customer input should have taken place in the very beginning of the process so that they identify a need for the product. However, it's always good to have a final check. Assuming that the prototype could be signed off as umm proving the engineering and manufacturing process. Then the review by the customer of this final product would be appropriate and umm if there are major difficulties they should be corrected in the prototype process. You know either in the engineering or manufacturing design should be re-done and the prototype umm built again. OK?

*Q10: OK. AS FAR AS THE HYPERMEDIA IS CONCERNED, WERE YOU ON THE PROJECT AT THE TIME EMDICIUM PRESENTED THE PROTOTYPE OF THE HYPERMEDIA?
CUSTOMER #3:
Yes.
*Q11: AND DID YOU PARTICIPATE IN THE REVIEW OF THE PROTOTYPE?
CUSTOMER #3:
Yes.
*Q12: OK. AND DID YOU NOTICE THAT YOUR INPUT TO THE PROTOTYPE...UMM, WERE THOSE SUGGESTIONS IMPLEMENTED IN THE FINAL PRODUCT?
Well, I was a consultant and umm the umm probably more meaningful suggestions as far as content might have come from the users.
*Q13: WERE THE USERS INVOLVED IN THE REVIEW SESSIONS?
CUSTOMER #3:
Yes. Yes, they were. Users and so-called subject-matter experts.
TONI:
OK.
CUSTOMER #3:
OK.
*Q14: RAPID PROTOTYPING HELPS TO PRODUCE A PRODUCT THAT IS IMMEDIATELY USABLE TO THE END USER.
CUSTOMER #3:
Agree *X*_
I agree if the design process is properly carried out. In other words, if the prototype proves the design then of course it's ready. Now we're talking about the hypermedia but I think that its...the same statement applies to the hypermedia prototype as it applies you know to the physical product you're working with. OK you know, if it is if it does in fact prove the process was carried out properly then it is immediately usable.
*Q15: OK, ALL RIGHT. AND FOR THIS THE HYPERMEDIA UMM PROJECT WAS THE PRODUCT DELIVERED ON TIME AND WITHIN THE BUDGET?
Umm I don't believe it as I recall I don't think it was but it's because we were really plowing very new ground at that time. Umm, it was really more than you know routine process or hypermedia design you know it was ha ha it was many many more obstacles. For example, umm the systems people we had, envisioned that we had purchased two servers to distribute the hypermedia to the various systems organizations so that they could distribute it to the users OK umm, the systems people were not entirely cooperative. In other words, they said that they had other priorities. And some people in some cases -- they absolutely refused to umm take any action that would support the program.
We were trying to build a home page only we didn't know that at that time. We didn't have the terminology at the time but we were trying to build a home page on the product development process. OK so that anybody in the company could umm access it in the same way that they access the various pages on the net today.

Umm, they simply didn't believe it. Umm, hypermedia was a very foreign concept to them. Although we went through we went through great pains to explain and cite research that umm proved that hypermedia probably was the least costly and probably most effective method of delivering this type of instruction. But it umm everything at Organization #2 seems to take forever. A new idea seems to take forever.

TONI:

I think that's probably typically of large organizations, too Yes it absolutely is Yeah, it just takes a long time.

*Q16: ANY ADDITIONAL COMMENTS?
IS THERE ANYTHING ELSE YOU CAN TELL ME ABOUT THE PROJECT FROM YOUR PERSPECTIVE?

CUSTOMER #3:

Well, again the reason I left it and that's strong advice. Is that if the top of the organization umm doesn't agree with it then go off and find another customer? OK we were so anxious to try this try this hypermedia that we put up with this silliness. It cost Organization #2 a lot of money and umm probably umm. Well what I umm did and what convinced me of it finally was that the position I was going to take was that umm I started now to talk to umm the grade 8 engineers. And I went one time one time I went to a class on umm not simultaneous engineering but the umm systems engineering they called it. So I sat with these grade 8 engineers who were getting the systems engineering training. I told em, I said Hey young man the whole product development process is on this umm hypermedia and I'll get you a set of disks and you can look at it. And it explains the whole product development process and it probably would be useful to you. So then I followed up and I asked them umm what'd you think of it? Oh it was great when I went through it. I said do you use it to link graphics to it? No. How come. Umm, well because we don't have time. Now then at one point umm in the cafeteria just by chance. You know the old saying no amount of playing can overcome dumb luck and I ran into a guy from the aircraft industry. He had umm joined Organization #2. And I asked him umm you know how did things work in the aircraft industry. How do umm what happens to an engineer, how does he learn how to engineer an aircraft. And he said well, first of all he has to go to a good engineering school. He cited his school from down south some place. Then he said you learn it at the knee of a good designer. So what happens is that this then led me to conclude that is that what's going on is that these people the engineers umm after they have received the engineering standard Bachelor of Engineering degree come to work at Organization #2. And they are then given on-the-job training, which is not at all, umm, it is not planned. It is not any formal kind of a training program. It probably could probably in my view it could probably save a huge amount of money and time if they had a standardized program for training these engineers how to do things rather than depending on the informal umm on-the-job training they have for them. There is no syllabus for it. No, nothing. They just say this is how we do it. And if they have any standard method on them it would have been a surprise.

TONI:

OK, perhaps if it had been done differently things would have worked out a lot better.

CUSTOMER #3:
Of course.
TONI:
Yeah, Okay.

Appendix G – Designer Logs

Log 001

*Instrumentation for the written survey for Emdicium Employees
*Survey for DESIGNER #1
*Project – Organization #1 Healthcare
*Q1: DESCRIBE THE DELIVERABLES?
Overview of Organization #1 products and services – 1 day, 4 module instructor's guide for instructor-led training with PowerPoint presentation
*Q99: PARALLEL TASKS
Not applicable
*Q100: DURATION
Not applicable
*Q2: HOW DID YOU IDENTIFY THE AUDIENCE?
All Organization #1 Healthcare System employees were identified by the sponsor. Because most employees were intimately knowledgeable with only one of three main products introductory level materials were deemed appropriate
*Q99: PARALLEL TASKS
Identify instructional needs
*Q100: DURATION
1 day including identify instructional needs
*Q3: HOW DID YOU IDENTIFY THE INSTRUCTIONAL NEED?
Based on management perception that employees could not speak knowledgeably about Organization #1 Healthcare products, an orientation was thought to be needed.
*Q99: PARALLEL TASKS
Identify instructional need
*Q100: DURATION
1 day including identify instructional need (1 day)
*Q4: HOW DID YOU IDENTIFY CONTENT, ETC?
Started with a single, knowledgeable SME. This provided scope. He left company before project completion. Then had to rely upon SME for each topic area – 11 in all
*Q99: PARALLEL TASKS
Develop instructional strategies
*Q100: DURATION
14 days spread over duration of project (14 days)
*Q5: HOW DID YOU IDENTIFY INSTRUCTIONAL STRATEGIES?
This was considered as the scope of content became clear. The general structure emerged and best means for conveying evolved and was reviewed with sponsor
*Q99: PARALLEL TASKS
Identify instructional strategies
*Q100: DURATION
14 days spread over duration of project (14 days)
*Q6: HOW DID YOU WRITE THE DESIGN CONCEPT MEMO?
This and an outline of content were (designer did not complete the sentence)

*Q99: PARALLEL TASKS
Not applicable
*Q100: DURATION
No response
*Q7: DESCRIBE THE DEVELOP THE HIGH-LEVEL CONTENT OUTLINE?
Writing outline (this continued to evolve up to the pilot)
*Q99: PARALLEL TASKS
Not applicable
*Q100: DURATION
3 days
*Q8: HOW DID YOU IDENTIFY CONTENT FOR THE PROTOTYPE?
Discussion with project team and consensus agreement
*Q99: PARALLEL TASKS
Not applicable
*Q100: DURATION
.5 days
*Q9 HOW DID YOU BUILD THE PROTOTYPE?
Project team (client) wanted more than one format for instructor's guide, as well as developed overheads, learner's guide and product reference guide
*Q99: PARALLEL TASKS
not applicable
*Q100: DURATION
1 week (5 days)
*Q10: DESCRIBE THE PROTOTYPE REVIEW/REVISE PROCESS
Had some difficulty arranging convenient time for team to review. Ultimately, there was considerable disagreement over instructor's guide style among team members. Made several revisions and reviews
*Q99: PARALLEL TASKS
Continued to collect content information
*Q100: DURATION
2 weeks (10 days)
*Q11: HOW DID YOU GET AGREEMENT REGARDING THE PROTOTYPE AND FREEZE THE CONTENT?
Finally achieved consensus on look and feel for instructor's guide, learner's guide, reference guide and overheads. Content was only 30% complete
*Q99: PARALLEL TASKS
Continued to collect content information
*Q100: DURATION
2 weeks (10 days)
*Q12: WHAT WAS INVOLVED IN WRITING THE REMAINING COMPONENTS?
Major challenge was instructor's guide format and extreme detail in reference guide
*Q99: PARALLEL TASKS
Collect content – review and revise with multiple SMEs
*Q100: DURATION
21 days

*Q13: DESCRIBE HOW YOU PILOT TESTED THE PRODUCT
Conducted with audience composed of instructional staff, management representativesand target audience representatives. Good feedback to enable revising
*Q99: PARALLEL TASKS
Not applicable
*Q100: DURATION
1 day
*Q14: WHAT REVISIONS WERE MADE TO THE PRODUCT?
Modified the instructor's guide. Minor changes to reference guide. Changed 2 activities to increase interactivity and reduce time
*Q99: PARALLEL TASKS
Not applicable
*Q100: DURATION
1 week (5 days)
*Q15: WHAT WAS INVOLVED IN DELIVERING THE PRODUCT?
Involved participating in first run of course and monitoring learner reactions. All materials and masters were turned over to client
*Q99: PARALLEL TASKS
Not applicable
*Q100: DURATION
1 day

Rapid prototyping appears to help produce quality instructional materials in less time than traditional instructional systems design models. It reduces cycle time since a small portion of the finished product represents a great deal of the finished product.
Agree ___ Disagree ___ Explain your response. If possible provide examples.
AGREE: ___ DISAGREE: X_
Under the circumstances of creating traditional courses with traditional content, rapid prototyping forced an interruption in the usual design/development process. Had the timing of the prototype been dictated by completion of content analysis rather than forced into a delivery timetable it may have proved beneficial. Rapid prototyping amounts to early formative evaluation through a sampling of the final product. Creating that sample is best done when the scope of the project and its content are known.

Complicating the situation at Organization #1 were three factors. First, there exists a "consensus" culture, whereby every aspect of the product and every change must be agreed to by all involved parties. Extremely time consuming because we were stuck after the prototype until all suggested changes were blessed. Second, the content was politically loaded because it dealt with three competing products, so upper level approval was always an issue. Last, personnel was always coming and going because the company is in its early growth stage.

Log 002

*Instrumentation for the written survey for Emdicium Employees
*Survey for DESIGNER #2
*Project – GPLUS
*Q1: DESCRIBE THE DELIVERABLES?
Instructor's guide, participant's guide, user's guide, on-line job aids
*Q99: PARALLEL TASKS
Not applicable
*Q100: DURATION
Not applicable
*Q2: HOW DID YOU IDENTIFY THE AUDIENCE?
During analysis phase gathered info re: audience, who they were and how they would use new system – how they would be affected by change
*Q99: PARALLEL TASKS
Review content and system; identify training/instructional needs
*Q100: DURATION
5-10 DAYS
*Q3: HOW DID YOU IDENTIFY INSTRUCTIONAL NEED?
Over a period of 2-3 weeks we met with the customer to discuss training needs and analyzed the system to learn how it worked and what users would need to know about the system
*Q99: PARALLEL TASKS
Review content and identify audience
*Q100: DURATION
5-10 DAYS
*Q4: HOW DID YOU IDENTIFY CONTENT, TASKS, PROCESS, ETC.?
This was part of the analysis phase. [We also] gathered content
*Q99: PARALLEL TASKS
Identify audience and identify instructional/training need
*Q100: DURATION
4.0 days
*Q5: HOW DID YOU IDENTIFY INSTRUCTIONAL STRATEGIES?
This was also part of analysis phase. Produced analysis report which eventually became training plan. Instructional strategies included on-line job aid, reader's on-line tutorial, a class with instructor's guide, participant's guide and user's guide
*Q99: PARALLEL TASKS
Identify audience, identify instructional/training need
*Q100: DURATION
IT TOOK 32.5 HOURS/4 DAYS TO PRODUCE THE ANALYSIS DOCUMENTATION (I.E., IDENTIFY AUDIENCE, IDENTIFY INSTRUCTIONAL NEED, IDENTIFY CONTENT, TASKS, ETC. AND IDENTIFY INSTRUCTIONAL PLUS 10.0 HOURS/8 DAYS TO DEVELOP THE TRAINING PLAN
*Q6: WHAT WAS IN THE DESIGN CONCEPT MEMO?
We gathered content and produced design memo
*Q99: PARALLEL TASKS

Create scenario list/task list; put together business process flows
*Q100: DURATION
11.5 HOURS/8.5 DAYS
*Q7: DESCRIBE THE DEVELOP THE HIGH-LEVEL CONTENT OUTLINE
Not applicable
*Q99: PARALLEL TASKS
Not applicable
*Q100: DURATION
Not applicable
*Q8: HOW DID YOU IDENTIFY CONTENT FOR THE PROTOTYPE?
Not really applicable. We just pulled one section from the design concept memo. This really didn't take any time at all
*Q99: PARALLEL TASKS
Gather scenario info
*Q100: DURATION
No response
*Q9: HOW DID YOU BUILD THE PROTOTYPE?
We had design meetings, write objectives, user's guide table of contents, templates, standards. At this point we added another resource who helped write documents, etc. I don't have access to her timesheets. The times listed here only represent my time. The prototype did not include the on-line job aide but did include the user's guide and instructor's guide.
*Q99: PARALLEL TASKS
Gather scenario info, review changes to business process, flowchart business process
*Q100: DURATION
42.5 hours/5 days
*Q10: DESCRIBE THE PROTOTYPE REVIEW/REVISE PROCESS
Reviewed user's guide with client. It was a gang review meeting in which we went over changes and markups. Some contented was reviewed. There were 3 users (John Frank, Don Soss and Sheryl Harrison) in the review meeting. There were 2 clients for this project – systems (Tom Lahyer) and the users who were the ultimate client
*Q99: PARALLEL TASKS
Scenario and content gathering
*Q100: DURATION
2 hours
*Q11: HOW DID YOU GET AGREEMENT REGARDING THE PROTOTYPE AND FREEZE THE CONTENT?
This happened at the review meeting. We made changes to systems procedures but the system was not done yet. The business process was frozen. The content for the instructor's guide and user's guide was frozen. The participant's guide had the scenarios and the user's guide was a reference document with procedures and how to's
*Q99: PARALLEL TASKS
No response
*Q100: DURATION

No response
*Q12: WHAT WAS INVOLVED IN WRITING THE REMAINING COMPONENTS?
User's guide development – we revised as needed, captured graphic screens for the on-line job aids. Facilitator/instructor's guide development – design and content review, edits and review meetings
*Q99: PARALLEL TASKS
No response
*Q100: DURATION
For the user's guide – 131 hours/16.6 days; for the facilitator/instructor's guide 42.5 hours/5.2 days
*Q13: DESCRIBE HOW YOU PILOT TESTED THE PRODUCT
[We did a]course pilot with SMEs. Used a completed facilitator's guide, participant's guide and user's guide. This task included prep for the pilot.
*Q99: PARALLEL TASKS
No response
*Q100: DURATION
For the pilot of the course – 16.0 hours/2 days; the prep – 10.0 hours/8.2 days
*Q14: WHAT REVISIONS WERE MADE TO THE PRODUCT?
[There were] revisions to the facilitator's guide. Revisions to user's guide included screen captures, graphics planning for the user's guide. The types of revisions included content, interface, graphics, etc.
*Q99: PARALLEL TASKS
No response
*Q100: DURATION
For the facilitator's guide 27.5 hours/3.4 days; revisions to the user's guide – 16.0 hours/2 days; graphics planning – 5.5 hours
*Q15: WHAT WAS INVOLVED IN DELIVERING THE PRODUCT?
The customer loved the product. The course was delivered with minor modifications (system changes and updates) from Jan, 1995 to Aug., 1997. The user's guide was recently modified and updated with very little change to layout. Needed to add all new screens because of new system.

Rapid prototyping appears to help produce quality instructional materials in less time than traditional instructional systems design models. It reduces cycle time since a small portion of the finished product represents a great deal of the finished product.
Agree ___ Disagree ___ Explain your response. If possible provide examples.
AGREE: __X_ DISAGREE: ___
We were able to produce a high quality product very quickly. The basic organization stayed the same. Changes and revisions were made because the system was in constant flux until launch. Our client didn't care much about layout issues for either the facilitator's guide or user's guide as long as we got the content right. The participant's guide was only 9 or 10 pages and only contained scenario information.

Log 003

*Instrumentation for the written survey for Emdicium Employees
*Survey for DESIGNER #3
*Project: Project #3
*Q1: DESCRIBE THE DELIVERABLES?
Project #3 included individual topics (Project #3 "processes"), made up of modules (files), that were electronically linked to a main Organizer Module (file). All topics were also interconnected with each other using links. There was also a glossary module that was linked to the topics and Organizer module using hot words. There were no adjunct, non-electronic materials.
*Q2: HOW DID YOU IDENTIFY THE AUDIENCE?
I did not participate in this task
*Q3: HOW DID YOU IDENTIFY INSTRUCTIONAL NEED?
I did not participate in this task.
*Q4: HOW DID YOU IDENTIFY CONTENT, TASKS, PROCESS, ETC.?
Project #3: I interviewed the SME (there was only one) and reviewed materials documenting the Project #3 Engineering Sign-Off process. The process itself was being developed simultaneously with the training.
*Q99: PARALLEL TASKS
On a single topic, no other tasks were performed concurrently with the initial research. However, I normally developed several topics at one timeand different topics were at different stages of development (one in research, one in development, etc.)
*Q100: DURATION
The initial SME interview for the Engineering Sign-Off Process took about half a day. Engineering Sign-Off was an average-sized topic, consisting of an Overview module and (as I recall) four detailed modules describing each of the major Engineering Sign-Off steps. During the initial interview, I gathered written source material to be used in developing the prototype. At the conclusion of the interview, I had everything I needed to begin development. (.5 DAYS)
*Q5: HOW DID YOU IDENTIFY INSTRUCTIONAL STRATEGIES?
I was not involved in selecting the overall instructional strategy, hypermedia. However, I did design the structure (number and relationship of modules), interactivity (links) and appearance of the Engineering Sign-Off materials.
*Q99: PARALLEL TASKS
AS PART OF THIS PROCESS, I LOOKED AT EXISTING PROJECT #3 HYPERMEDIA MATERIALS TO DETERMINE HOW I COULD DESIGN A STRUCTURE THAT WOULD WORK WELL WITH THEM (A KEY CONSIDERATION SINCE THEY WOULD ALL BE LINKED TOGETHER).
*Q100: DURATION
IDENTIFICATION OF THE STRATEGY (STRUCTURE) THAT WOULD BE USED FOR THE ENGINEERING SIGN-OFF TOPIC TOOK ABOUT TWO DAYS. THIS WAS LARGELY DUE TO THE FACT THAT THE ENGINEERING SIGN-OFF PROCESS ITSELF WAS WELL DEFINED AND THE SOURCE MATERIALS WERE VERY COMPLETE AND WELL WRITTEN. (NOTE: THE STRUCTURE AND CONTENT OF THE

ENGINEERING SIGN-OFF TOPIC REMAINED STABLE THROUGHOUT DEVELOPMENT RESULTING IN NO "RESTARTS" AND FEW REVISIONS. OTHER TOPICS DID NOT FARE AS WELL. QUALITY OF THE UNDERLYING PROJECT #3 PROCESS AND THE SOURCE MATERIAL WERE BIG FACTORS IN THE SUCCESS OF DEVELOPING PROTOTYPES RIGHT THE FIRST TIME. (THIS WOULD BE TRUE FOR A NON-PROTOTYPED PROJECT AS WELL.) (2 DAYS)
*Q6: WHAT WAS IN THE DESIGN CONCEPT MEMO?
I WAS NOT INVOLVED IN WRITING THE OVERALL DESIGN CONCEPT FOR THE PROJECT #3 TRAINING. HOWEVER, I DID WRITE A DESIGN MEMO FOR THE EACH TOPIC I DEVELOPED (IT WAS A REQUIRED PART OF THE DEVELOPMENT PROCESS). APPROVAL OF THE DESIGN MEMO LAUNCHED DEVELOPMENT OF THE FIRST ONLINE PROTOTYPE (DESCRIBED ON THE FIRST PAGE OF THIS FILE).
*Q99: PARALLEL TASKS
Concurrently with developing the online structure, I provided go-by's for graphics to the graphic artist to use in developing "pencil" sketches of proposed graphics. These sketches were used to supplement presentation of the prototype to the client (SUBJECT MATTER EXPERT).
*Q100: DURATION
Development of the Engineering Sign-Off online prototype took about a week and a half. (2 DAYS)
*Q7: WHAT WAS IN THE DEVELOP THE HIGH-LEVEL CONTENT OUTLINE?
The high-level content outline was included in the Design Memo described above. When the client approved the design (structure and treatment), he also approved the outline.
*Q99: PARALLEL TASKS
This task was done in parallel with developing the Design Memo.
*Q100: DURATION
This task had no duration of its own.
*Q8: HOW DID YOU IDENTIFY CONTENT FOR THE PROTOTYPE?
I obtained content for prototypes during or shortly after my SME review of the Design Memo (as I recall, for Engineering Sign-Off, additional resource material was handed over at that time). Approval of the Design Memo launched development of the prototype itself with no further research. For other hypermedia topics, approval of the Design Memo launched scheduling of more in-depth research.
*Q99: PARALLEL TASKS
Identification of content was done concurrently with approval of the Design Memo.
*Q100: DURATION
For the Engineering Sign-Off topic, this step had no duration. (Duration of this step varied widely among the various hypermedia topics developed. If the topic was stable and well documented, identifying content went quickly. If the topic was not stable or well documented, or if there were many SMEs, it often took as much as half the development time to identify the content).

*Q9: HOW DID YOU BUILD THE PROTOTYPE?
The content of the Project #3 prototype is described on the first page of this file. The development process included "prototyping" as a key step that had to be completed successfully before other steps could begin. The "prototype" also had a specific definition: a working set of files that included all main screens with their high-level text, all popup boxes and detail screens with a description of what they would contain, a verbal description of all graphicsand sketched storyboard of all graphics. Project #3 is a good example of things gone right because the prototype was actually defined and treated as a deliverable.
*Q99: PARALLEL TASKS
While I developed the online prototype, the graphic artist developed pencil sketches of the illustrations. I also started to identify glossary terms so I could get approved definitions from the SME during the prototype approval meeting.
*Q100: DURATION
Building (writing, testing and debugging) the Engineering Sign-Off prototype took about two weeks. (10 DAYS)
*Q10: DESCRIBE THE PROTOTYPE REVIEW/REVISE PROCESS
The prototype was reviewed by formally presenting it online to the SME. The SME had the opportunity to click through the material and comment on the content, appearance and functionality. During this review, the SME provided additional detailed source material to be used in writing popup box and detail screen content. There were very few (if any) changes to the prototype during this review.
*Q99: PARALLEL TASKS
The prototype review also included review and approval of the graphic pencil sketches.
*Q100: DURATION
The client prototype review of the Engineering Sign-Off module took less than one-half day. (.5 DAYS)
*Q11: HOW DID YOU GET AGREEMENT REGARDING THE PROTOTYPE AND FREEZE THE CONTENT?
For Engineering Sign-Off, SME agreement with the prototype (after the prototype review) constituted freezing the high-level content. Based on the prototype review, the SME provided additional detailed source material to be used to fill in popup boxes and detail screens.
*Q99: PARALLEL TASKS
The SME was given a development schedule to completion as a result of the high-level prototype review. At that time, the topic was also added to the upcoming planned Project #3 hypermedia "release."
*Q100: DURATION
For Engineering Sign-Off, this was done concurrently with the prototype review. It had no duration of its own.
*Q12: WHAT WAS INVOLVED IN WRITING THE REMAINING COMPONENTS?
There were no remaining "components" in the Project #3 assignment. However, I did have to write full first and second drafts that included filling in the popup boxes and detail screensand inserting the completed graphics. The interface appearance

and functionality needed no further work, as they were developed and debugged in the high-level prototype. Note: Development of the entire Engineering Sign-Off topic (the steps performed prior to development of the formal release) took about seven weeks. Everything went as planned. ESO was cited to the client as an example of how quickly topics could be developed when the underlying content was stable and well-documentedand SMEs knew what they wanted.
*Q99: PARALLEL TASKS
Concurrently with writing (and having reviewed) full first and second drafts, I wrote definitions for glossary termsand a summary of the Engineering Sign-Off process that would be added to the Organizer Module.
*Q100: DURATION
Development of the rest of the Engineering Sign-Off topic (not including linking to other topics) took about three weeks. (15 days)
*Q13: DESCRIBE HOW YOU PILOT TESTED THE PRODUCT
Project #3 pilots were a "release" step. A release involved identifying all the topics that would be included in the release, adding all new terms to the glossary, adding a topic summary for each released topic to the Organizer Module, linking new topics to the Organizer Module, linking new topics to each other, linking new topics to all previously-released topics. Individual topics were not piloted. The "release" was piloted. A release normally included three or four new topics.
*Q99: PARALLEL TASKS
No activities were performed concurrently with the pilot.
*Q100: DURATION
A release pilot normally took one day. (1 day)
*Q14: WHAT REVISIONS WERE MADE TO THE PRODUCT?
Revision after a release pilot normally included fixing typos and bugs. It did not involve adding new content. SMEs were invited to attend the pilot, but pilots were primarily conducted with representative users.
*Q99: PARALLEL TASKS
No development activities were performed concurrently with post-pilot revisions. The client began arranging implementation of the new release at this.
*Q100: DURATION
A release revision normally took about two weeks (for all developers and all topics). Most of this time was taken up with final testing and debugging. (10 days)
*Q15: WHAT WAS INVOLVED IN DELIVERING THE PRODUCT?
I did not participate in this task.

Rapid prototyping appears to help produce quality instructional materials in less time than traditional instructional systems design models. It reduces cycle time since a small portion of the finished product represents a great deal of the finished product.
Agree ___ Disagree ___ Explain your response. If possible provide examples.
AGREE: *X*_ DISAGREE: ___
For Project #3, I agree with the statement because the design and development process was well thought out and enforced. The prototype was identified as a deliverable that, once approved, launched other development activities. By the way, Project #3 also used a template for development. It included primary screen

design and functionality. The template was NOT the prototype—it was a tool for developing the prototype. The Project #3 prototype was a fully-functioning, high-level version of the final course that was formally presented to the client as a prototype.

Appendix H – Follow-Up Questions with Emdicium Employees via Email

Project #1
Subj: Re: Dissertation Follow-up
Date: 98-04-02 08:46:54 EST
From: xxxxxx@emdicium.com (Designer #1)
To: Tonisjones@aol.com (Tonisjones)

At 05:29 AM 4/1/98 EST, you wrote:
>Designer, do you know when and if Organization #1 began conducting the classes you produced
>for them?
ANSWER: Organization #1 began conducting classes immediately throughout the organization on a monthly basis.
Do you know if the classes are still being conducted (when did you
>last here they were being conducted?)
ANSWER: I was advised that the class was still being conducted when I contacted Organization #1 in January, 1998.
Was the class and reference guide
>intended for long term use (more than a year) or short term user?
ANSWER: The course materials were intended to be used for a long period of time. However, it was expected that periodic updating would be required as products and services changed. To enable this, the reference document was provided in electronic form to allow Organization #1 to perform its own routine maintenance. The instructional materials (Instructor's and Learner's Guides; transparencies; activities; etc.) were intended for long-term use without need for frequent revision. Since we did not contract for either confirmative or level 3 follow-up evaluation, I do not know how these materials have stood the test of time.
>
>After the materials were delivered to them did you have to make more
>modifications or were the materials immediately usable?
ANSWER: Following pilot, the materials were given a final "tweek" and delivered. They were immediately used "as is".
Do you know if they
>have modified it at all since delivery? Did you do a confirmative evaluation?
>If so what was the outcome?
>ANSWER: See above
>I need this information asap. It is for Chapter 4 – Results. I just realized
>that I did not ask you this stuff before. On the other projects these were
>customer questions but since I did not interview your customer I'm asking you.
>Help ☺
>

---------- Headers ----------
Return-Path: <xxxxxx@emdicium.com>
Received: from rly-za01.mx.aol.com (rly-za01.mail.aol.com [172.31.36.97]) by
air-za05.mail.aol.com (v40.16) with SMTP; Thu, 02 Apr 1998 08:46:54 –0500
Received: from emdicium.com (smtp.emdicium.com [38.221.97.2])
by rly-za01.mx.aol.com (8.8.5/8.8.5/AOL-4.0.0)
with ESMTP id IAA04244 for <Tonisjones@aol.com>;
Thu, 2 Apr 1998 08:46:52 –0500 (EST)
Received: by emdicium.com from localhost
(router,SLMail V2.6); Thu, 02 Apr 1998 08:32:47 –0500
Received: by emdicium.com from xxxxxx.emdicium.com
(38.221.97.11::mail daemon; unverified,SLMail V2.6); Thu, 02 Apr 1998
08:32:46 –0500
Message-Id: <3.0.1.32.19980402084809.0068e5fc@38.221.97.2>
X-Sender: xxxxxx@38.221.97.2
X-Mailer: Windows Eudora Light Version 3.0.1 (32)
Date: Thu, 02 Apr 1998 08:48:09 –0500
To: Tonisjones <Tonisjones@aol.com>
From: "Designer #1" <xxxxxx@emdicium.com>
Subject: Re: Dissertation Follow-up
In-Reply-To: <8c1ef595.3522172a@aol.com>
Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"

Subj: Re: Dissertation Follow-up – another question
Date: 98-04-03 09:49:41 EST
From: Designer #1@emdicium.com (Designer #1)
To: Tonisjones@aol.com (Tonisjones)

At 08:07 PM 4/2/98 EST, you wrote:
>Thanks Designer #1.
>
>One more questions...based on what you know was the customer satisfied with
>the deliverables and with the rapid prototyping process itself?
ANSWER: As far as I know, the customer was pleased with the final
deliverable. In particular, the Reference Guide was seen as a valuable tool
for all Organization #1 HealthCare System employees, with or without the class.
The
Instructor's guide was tailored to their specifications and included
"training wheels" for new instructors. However, the main advantage to the
rapid prototyping was that it surfaced a concern by the intended instructor
and that it lacked sufficient detail for her (a non-expert) to conduct the
training. This resulted in a month's worth of additional work to modify and
satisfy the customer. Had this instructor been included in the earlier
product development meetings where formative evaluation of evolving
materials had occurred, this situation could have been minimized or avoided

altogether.
What is your
>response based on?
ANSWER: My impressions, direct feedback from the primary Organization #1
interface, and
class reactions.
>

---------- Headers ----------
Return-Path: <Designer #1@emdicium.com>
Received: from rly-za03.mx.aol.com (rly-za03.mail.aol.com [172.31.36.99]) by
air-za03.mail.aol.com (v40.16) with SMTP; Fri, 03 Apr 1998 09:49:41 –0500
Received: from relay1.smtp.psi.net (relay1.smtp.psi.net [38.8.14.2])
by rly-za03.mx.aol.com (8.8.5/8.8.5/AOL-4.0.0)
with ESMTP id JAA09494 for <Tonisjones@aol.com>;
Fri, 3 Apr 1998 09:49:40 –0500 (EST)
Received: from emdicium.com by relay1.smtp.psi.net (8.8.5/SMI-5.4-PSI)
id JAA18663; Fri, 3 Apr 1998 09:49:37 –0500 (EST)
Received: by emdicium.com from localhost
(router,SLMail V2.6); Fri, 03 Apr 1998 09:40:22 –0500
Received: by emdicium.com from Designer #1.emdicium.com
(38.221.97.11::mail daemon; unverified,SLMail V2.6); Fri, 03 Apr 1998
09:40:21 –0500
Message-Id: <3.0.1.32.19980403094949.0069381c@38.221.97.2>
X-Sender: Designer #1@38.221.97.2
X-Mailer: Windows Eudora Light Version 3.0.1 (32)
Date: Fri, 03 Apr 1998 09:49:49 –0500
To: Tonisjones <Tonisjones@aol.com>
From: "Designer #1" <Designer #1@emdicium.com>
Subject: Re: Dissertation Follow-up – another question
In-Reply-To: <82bf5c0.3524364c@aol.com>
Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"

Project #2
Subj: Re: Project #2 – additional info for dissertation
Date: 98-04-01 15:24:03 EST
From: xxxxxx@emdicium.com (Designer #2)
To: Tonisjones@aol.com (Tonisjones)

Hi, I did updates last fall and moved it all to Doc-To-Help. Everything
was then passed on to Organization #2 (Mary Monroe's group) for formatting
(PageMaker), maintenance and implementation. I'm not sure where they are
going with it. Good luck, sounds like you are moving along.

Designer #2

At 04:44 AM 04/01/98 EST, you wrote:
>Designer #2, are you currently updating the Project #2 class and on-line help?
Also is
>the class and the help still being used at Organization #2 and conducts the class?
>
>Toni
>
>P.S. I'm doing Chapter 4 and realize that I need this info. Take care.
>
Designer #2
The Emdicium Group, Inc. "Right the first time. Better the next time."
X.221.97 http://www.emdicium.com

---------- Headers ----------
Return-Path: <xxxxxx@emdicium.com>
Received: from rly-zb05.mx.aol.com (rly-zb05.mail.aol.com [172.31.41.5]) by air-zb04.mail.aol.com (v40.16) with SMTP; Wed, 01 Apr 1998 15:24:02 –0500
Received: from emdicium.com (smtp.emdicium.com [38.221.97.2])
by rly-zb05.mx.aol.com (8.8.5/8.8.5/AOL-4.0.0)
with ESMTP id PAA18403 for <Tonisjones@aol.com>;
Wed, 1 Apr 1998 15:23:53 –0500 (EST)
Received: by emdicium.com from localhost
(router,SLMail V2.6); Wed, 01 Apr 1998 15:09:53 –0500
Received: by emdicium.com from Xxxxxx.emdicium.com
(38.221.97.10::mail daemon; unverified,SLMail V2.6); Wed, 01 Apr 1998 15:09:52 –0500
Message-Id: <3.0.1.32.19980401152705.006a3c50@38.221.97.2>
X-Sender: xxxxxx@38.221.97.2
X-Mailer: Windows Eudora Light Version 3.0.1 (32)
Date: Wed, 01 Apr 1998 15:27:05 –0500
To: Tonisjones <Tonisjones@aol.com>
From: "Designer #2" <xxxxxx@emdicium.com>
Subject: Re: Project #2 – additional info for dissertation
In-Reply-To: <2acd265.35220c6a@aol.com>
Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"

Subj: Re: Project #2 – additional info for dissertation
Date: 98-04-02 09:33:13 EST
From: xxxxxx@emdicium.com (Designer #2)
To: Tonisjones@aol.com (Tonisjones)

As far as I know they are still running the class, but someone else rewrote it when a new version of the software was released and they didn't like the way Tom Steiner was runnning the class. In other words, we lost the work as best I can tell. The Project #2 manager wanted to get out of the training business and Mary Monroe offered to maintain the class and deliver it – I was called in to make the changes in the User's guide (and online help) which was then used to make the changes in the class. I don't think the current class follows the original design. In fact, I know the trainer changed it substantially and now teaches it on a screen by screen basis instead of based on scenarios. I hope this info helps – just remember, this too shall pass.

At 06:52 PM 04/01/98 EST, you wrote:
>In a message dated 98-04-01 15:24:03 EST, you write:
>
><< I'm not sure where they are
going with it. Good luck, sounds like you are moving along. >>
>So does this mean that they are no longer running the class that you did at
>all? Or perhaps you don't know. Forgive me for pressing but you know how
it is >☺
>
Designer #2
The Emdicium Group, Inc. "Right the first time. Better the next time."
http://www.emdicium.com

---------- Headers ----------
Return-Path: <xxxxxx@emdicium.com>
Received: from relay12.mx.aol.com (relay12.mail.aol.com [172.31.109.12]) by
air10.mail.aol.com (v40.16) with SMTP; Thu, 02 Apr 1998 09:33:13 –0500
Received: from emdicium.com (smtp.emdicium.com [38.221.97.2])
by relay12.mx.aol.com (8.8.5/8.8.5/AOL-4.0.0)
with ESMTP id JAA10459 for <Tonisjones@aol.com>;
Thu, 2 Apr 1998 09:33:11 –0500 (EST)
Received: by emdicium.com from localhost
(router,SLMail V2.6); Thu, 02 Apr 1998 09:19:05 –0500
Received: by emdicium.com from Xxxxxx.emdicium.com
(38.221.97.10::mail daemon; unverified,SLMail V2.6); Thu, 02 Apr 1998
09:19:04 –0500
Message-Id: <3.0.1.32.19980402093628.006a3d7c@38.221.97.2>
X-Sender: xxxxxx@38.221.97.2
X-Mailer: Windows Eudora Light Version 3.0.1 (32)
Date: Thu, 02 Apr 1998 09:36:28 –0500
To: Tonisjones <Tonisjones@aol.com>
From: "Designer #2" <xxxxxx@emdicium.com>
Subject: Re: Project #2 – additional info for dissertation
In-Reply-To: <c62f889c.3522d33b@aol.com>

Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"

Subj: Re: Project #2 – one more question ☺
Date: 98-04-02 09:36:11 EST
From: xxxxxx@emdicium.com (Designer #2)
To: Tonisjones@aol.com (Tonisjones)

I did the updates to the User's guide and then used that as the basis for the on-line help using Doc-to-Help. I wasn't asked to update the Instructor Guide – someone else took my User's guide updates and updated the Instructor Guide and the class.

At 07:11 PM 04/01/98 EST, you wrote:
>In a message dated 98-04-01 15:24:03 EST, you write:
>
><< Hi, I did updates last fall and moved it all to Doc-To-Help >>
>Does 'it' refer to the on-line help? Or the on-line help and the instructor
>guide for the class?
>
>Toni
>
Designer #2
The Emdicium Group, Inc. "Right the first time. Better the next time."
 http://www.emdicium.com

---------- Headers ----------
Return-Path: <xxxxxx@emdicium.com>
Received: from relay12.mx.aol.com (relay12.mail.aol.com [172.31.109.12]) by air28.mail.aol.com (v40.16) with SMTP; Thu, 02 Apr 1998 09:36:11 –0500
Received: from emdicium.com (smtp.emdicium.com [38.221.97.2])
by relay12.mx.aol.com (8.8.5/8.8.5/AOL-4.0.0)
with ESMTP id JAA17391 for <Tonisjones@aol.com>;
Thu, 2 Apr 1998 09:36:08 –0500 (EST)
Received: by emdicium.com from localhost
(router,SLMail V2.6); Thu, 02 Apr 1998 09:22:03 –0500
Received: by emdicium.com from xxxxxx.emdicium.com
(38.221.97.10::mail daemon; unverified,SLMail V2.6); Thu, 02 Apr 1998 09:22:02 –0500
Message-Id: <3.0.1.32.19980402093926.006a6514@38.221.97.2>
X-Sender: xxxxxx@38.221.97.2
X-Mailer: Windows Eudora Light Version 3.0.1 (32)
Date: Thu, 02 Apr 1998 09:39:26 –0500
To: Tonisjones <Tonisjones@aol.com>

From: "Designer #2" <xxxxxx@emdicium.com>
Subject: Re: Project #2 – one more question ☺
In-Reply-To: <778d4cd4.3522d7bb@aol.com>
Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"

Project #3
Subj: Re: Project #3 info
Date: 98-04-09 18:35:25 EDT
From: Designer #3@gr-lakes.com (Designer #3)
Reply-to: Designer #3@gr-lakes.com
To: Tonisjones@aol.com (Tonisjones)

Tonisjones wrote:
>
> Hi Designer #3!
>
> How are you. Long time no see or hear. I hope all is well with you.
>
> I am trying to complete my dissertation and realize I need a little more
> information from you.
>
> I thought I had asked you this but I don't have it in my transcripts so
> forgive me for asking again but...how would you compare using rapid
> prototyping with using a traditional model? Is the process longer/shorter when
> using rapid prototyping? Please explain your answer. Also, what about the
> usability and longevity of the product with rapid prototyping versus when
> using a traditional model.
>
> Final questions...was your customer satisfied with your module? How do you
> know?
>
> I look forward to hearing from you. I need this right away like by the weekend
> if at all possible.
>
> Take care and hope to see you soon.
>
> Toni

Hi Toni! -- Here's the information I promised.

COMPARISON OF RAPID PROTOTYPING TO THE TRADITIONAL
(DRAFT MANUSCRIPT AND STORYBOARD) METHOD
Shorter vs. Longer: In terms of preparing draft manuscripts and
storyboards, the process takes the same amount of time, or more time if
programming of the prototype is involved. But there are time savings
elsewhere including

519
520 ¨ fewer client reviews
521 ¨ fewer drafts
522 ¨ less time preparing for the pilot (the programming is already done) and
523 ¨ fewer re-do's, because the client gets to see the 'real thing' early
524 on. The client doesn't have to use his or her imagination to guess what
525 the final product will look like or how it will work
526
527 USABILITY/LONGEVITY
528 Usability: Usability is better because usability testing is built into
529 every internal and client review. Even if there isn't a pilot, a
530 prototyped product has received some usability testing simply by being
531 reviewed.
532
533 Longevity: I don't think rapid prototyping increases longevity. (When
534 the subject matter becomes out-of-date, it's out-of date regardless of
535 how it was developed.)
536
537 WAS MY CUSTOMER SATISFIED?
538 My customer was Emdicium. I think that the principals were pleased
539 with the short amount of time it took to develop the Engineering
540 Sign-off module. (Remember that the subject matter expert's
541 well-organized source material, and his clear vision of what he wanted
542 in the module were as responsible for the efficiencies as was the
543 prototyping process.) Emdicium used the ESO module as an example to
544 Organization #2 of how quickly (and at reasonable cost) a hypermedia module
545 could be developed when the subject matter expert was prepared. As for
546 Organization #2's reaction to a time- and cost-effective module, I don't really
547 know. A principal may have a better idea what Ford's reaction was.
548 ---
549 I think that covers all of your questions—let me know if you have any
550 more.
551
552 Have a great holiday weekend . . .
553
554 Designer #3
555
556
557 ---------- Headers ----------
558 Return-Path: <Designer #3@gr-lakes.com>
559 Received: from relay21.mx.aol.com (relay21.mail.aol.com [172.31.106.67]) by
560 air12.mail.aol.com (v41.14) with SMTP; Thu, 09 Apr 1998 18:35:25 -0400
561 Received: from dns1.gr-lakes.com (dns1.gr-lakes.com [204.120.126.34])
562 by relay21.mx.aol.com (8.8.5/8.8.5/AOL-4.0.0)
563 with ESMTP id SAA16894 for <Tonisjones@aol.com>;
564 Thu, 9 Apr 1998 18:35:20 -0400 (EDT)

Received: from dns1.gr-lakes.com (Designer #3@Huron.gr-lakes.com
[204.120.126.40])
by dns1.gr-lakes.com (8.8.7/8.8.7) with SMTP id SAA20358
for <Tonisjones@aol.com>; Thu, 9 Apr 1998 18:36:37 -0400
Message-ID: <352D4CF8.4D23@gr-lakes.com>
Date: Thu, 09 Apr 1998 18:34:32 -0400
From: Designer #3 <Designer #3@gr-lakes.com>
Reply-To: Designer #3@gr-lakes.com
Organization: Designer #3. Instructional Designer. Writer. Editor.
X-Mailer: Mozilla 3.0 (Win95; I)
MIME-Version: 1.0
To: Tonisjones <Tonisjones@aol.com>
Subject: Re: Project #3 info
References: <5faca7fb.352ab444@aol.com>
Content-Type: text/plain; charset=iso-8859-1
Content-Transfer-Encoding: 8bit

Projects #2 & 3
Subj: Dissertation information
Date: 98-04-02 11:14:36 EST
From: xxxxxx@emdicium.com (Emdicium Bookkeeper)
To: toni@emdicium.com (Toni Stokes Jones)

Project #3 Overview classes were taught an average of 3 times monthly (two instructors each time). The last class was conducted on December 12, 1996.

I do not know what version Organization #2 is currently using. We sent the last of our classroom materials to Organization #2 in April of 1997. We have not been involved in any updates or changes.

I also do not know if Organization #1 continues to use our materials. To date we have
not been involved in any updates or changes. Perhaps Designer #1 would know.

Subj: Dissertation Information
Date: 98-04-03 11:35:39 EST
From: tj19@chrysler.com
To: tonisjones@aol.com

FYI
---------- Forwarded by Toni S Jones/TCC/Chrysler on
04/03/98 10:03 AM ----------

VP Sales & Marketing @ emdicium.com on 04/02/98 04:51:33 PM
To: Toni S Jones/TCC/Chrysler

cc:
Subject: Dissertation Information

I understand you are looking for info on Organization #3 and Organization #1.

Organization #3: Our last class was 12/12/96 and the hypermedia was discontinued in
early 97. The program was replaced with FPSD developed by Ernst and Young.
They had classes and info on the web but used our stuff as the basis. If you need numbers of students trained I think we could get that for you, let me know.

Organization #1: Continues to use our materials. They do the updates themselves. I'm
talking to them about developing some new stuff to expand upon our first effort.

Regards,

VP Sales & Marketing
VP Sales & Marketing
The Emdicium Group, Inc.
Phone 248.644.5160
Fax 248.644.0460

---------- Headers ----------
Return-Path: <tj19@chrysler.com>
Received: from rly-za05.mx.aol.com (rly-za05.mail.aol.com [172.31.36.101]) by air08.mail.aol.com (v40.16) with SMTP; Fri, 03 Apr 1998 11:35:38 –0500
Received: from fxiod01.is.chrysler.com (fxiod01.is.chrysler.com [204.189.94.70])
by rly-za05.mx.aol.com (8.8.5/8.8.5/AOL-4.0.0)
with SMTP id LAA27010 for <tonisjones@aol.com>;
Fri, 3 Apr 1998 11:35:38 –0500 (EST)
From: tj19@chrysler.com
Received: by fxiod01.is.chrysler.com; id LAA26730; Fri, 3 Apr 1998 11:33:12 –0500
Received: from mhbclpr2-nf0.is.chrysler.com(129.9.212.187) by fxiod01.is.chrysler.com via smap (3.2)
id xma026554; Fri, 3 Apr 98 11:32:49 –0500
Received: from ODEMXPR1.ODDC.CHRYSLER.COM (odemxpr1-dgen0.oddc.chrysler.com [129.9.196.20])
by mhbclpr2-nf0.is.chrysler.com (8.8.5/8.8.5/chrysler-relay.1.2-kcd) with SMTP id LAA21469
for <tonisjones@aol.com>; Fri, 3 Apr 1998 11:35:13 –0500 (EST)

659 Received: by ODEMXPR1.ODDC.CHRYSLER.COM (Soft-Switch LMS 2.0)
660 with snapi
661 via NOTES id 0041200005329633; Fri, 3 Apr 1998 11:34:34 –0500
662 To: <tonisjones@aol.com>
663 Subject: Dissertation Information
664 Message-ID: <004120000532963300002L032*@MHS>
665 Date: Fri, 3 Apr 1998 11:34:34 –0500
666 MIME-Version: 1.0
667 Content-Type: text/plain; charset=us-ascii
668

Appendix I – Permission Letter

Letter from The Emdicium Group, Inc. principals granting permission to conduct study

the emdicium group, inc.sm
instructional innovation

June 23, 1997

Ms. Toni Stokes Jones
The Emdicium Group, Inc.
30600 Telegraph Rd., Suite 1305
Bingham Farms, MI 48025

Dear Toni:

This letter gives you the permission of The Emdicium Group, Inc. to use employees, customers and contractors of Emdicium in your doctoral research titled "Validating the Process of Designing and Developing Instructional Materials Using the Rapid Prototyping Methodology."

We look forward to working with you on the study and obtaining the results of the study.

Best of luck!

Sincerely,

Timothy W. Spannaus, Ph.D.
President

References

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Burkart, R. E. (1994). Reducing R&D cycle time. Research Technology Management(37) 3, 27-32.

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Dick, W. & Carey, L. (1996). The systematic design of instruction. New York, NY: HarperCollins Publishers Inc.

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Dormant, D. (1986). Clients are people, too!. Performance and Instructional Journal. 3-5.

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Haugen, E., J., & Nedwek, B. P., (1988). Using prototyping and simulation as decision tools in a purchased-software implementation. Cause/Effect, 11 (5), 11-16.

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Ingram, A. L., Heitz, K., Reid, C., Walsh, M. B. & Wells, C. (1994). Working with subject matter experts. Performance & Instruction 33 (8), 17-22.

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Kim, Y., & Reigeluth, C. M. (1995, February). Rapid prototyping for task analysis and sequencing with the simplifying conditions method. Presented at the meeting of the Association for Educational Communications and Technology, Anaheim, CA.

Lange, S. R. & Shanahan, C. M. (1996). Designing instructor-led schools with rapid prototyping. Performance Improvement, 35 (8), 26-29.

Law, M. P., Okey, J. R., & Carter, B. J. (1995, February). Developing electronic performance support systems for professions. Presented at the National Convention of the Association for Educational Communications and Technology, Anaheim, CA

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Abstract

VALIDATING THE PROCESS OF DESIGNING AND DEVELOPING INSTRUCTIONAL MATERIALS USING THE RAPID PROTOTYPING METHODOLOGY

by

TONI STOKES JONES

December 1998

Advisor: Dr. Rita Richey

Major: Instructional Technology

Degree: Doctor of Philosophy

The purpose of this study was to validate use of a rapid prototyping methodology using qualitative methods in an effort to answer the following questions:

1. What does the instructional designer/developer do when using the rapid prototyping methodology?
2. What does the customer do when using the rapid prototyping methodology?
3. To what extent does the rapid prototyping methodology reduce the design and development cycle time?
4. To what extent does the rapid prototyping methodology produce a better instructional product?

The participants of the study were instructional designers from a training and development consultant firm and some of their customers.

The conclusions of this study indicate that The Emdicium rapid prototyping methodology is a valid model. This study also suggests that the instructional designer's collaborative effort with the customer results in enhanced levels of satisfaction and that

customer involvement through using and experiencing the prototype appears to be a major aspect of rapid prototyping. Additionally, it appears that cycle time is slightly increased when using the rapid prototyping methodology. Overall, the study seems to point to a win-win environment for both the customer and the design team when rapid prototyping methods are adopted.

Autobiographical Statement

Toni Stokes Jones is a native of Detroit, Michigan. She is the daughter of LeRoy and Hermalene Stokes, the wife of Louis Jones and the sister of James Stokes and Crystal Frierson. Toni attended Detroit's Mumford High School until 1972 when she matriculated at Wayne State University, also located in Detroit, Michigan. In 1988, she obtained a M.Ed. in Instructional Technology, and in 1998, she completed the requirements for a Ph.D. in Instructional Technology. She is currently an instructional designer at The Emdicium Group, Inc. and an adjunct professor at The University of Michigan - Dearborn. Additionally, Toni mentors young girls in the Seeds and Keys Female Responsibility Program at Greater New Mt. Moriah Missionary Baptist Church.